THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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ELECTRICAL TERMINOLOGY.

THE subject of electrotechnical units, terms and symbols is one which never fails to arouse discussion when it is broached; to many it is of fascinating interest, and from time to time new propositions are put forward with the honest intention, undoubtedly, of facilitating the free interchange of ideas and assimilation of knowledge. Unfortunately, too often these proposals are by no means well adapted to attain the desired end, but on the contrary tend to obscure the light, or to aggravate confusion where it already exists. We recently drew attention to some examples of the latter description in our notes on "Nunits and Abbns" and the "Myriawatt," and we are pleased to note that many eminent engineers in the United States have joined with us in condemning the myriawatt on the ground of its absolute lack of scientific justification. In spite of its official adoption by a joint Committee of American Engineers, we anticipate that it will never come into practical use.

That uniformity in technical terminology is very greatly to be desired is, however, beyond question, and excellent work is being done in the direction of its attainment by the periodical International Electrical Congresses and by the International Electrotechnical Commission; the latter body in particular places this object in the forefront of its programme, and though progress is necessarily slow, owing to the great number of divergent interests to be reconciled, it is sound and enduring. In view of the authority which is wielded by the Commission as an international body, we were surprised to find amongst the *Proceedings* of the British Association a report issued on behalf of a Committee on Electrical Nomenclature, in which not only were the recommendations of the I.E.C. criticised, mainly on somewhat academical grounds, but a somewhat different set of symbols was put forward, together with a number of definitions, &c. We have no wish to detract from the high merits of the British Association, to which we owe the admirable system of electrical units which has been of such immense value to the progress of the industry; but an international body must take precedence of a semi-private organisation, and while criticism of the I.E.C.'s proposals may be perfectly in order, we cannot sympathise with the attempt to supersede them with a set drawn up by half a dozen representatives of the electrical industry. There is, indeed, a doubt whether the report really represents the views of the Committee, judging from a letter published in one of our contemporaries; but the fact remains that the report was officially printed and issued, with the names of the Committee attached, and it contains nothing to show that it is not perfectly authentic.

Passing from the general to the particular, we wish to take this opportunity of protesting against the use of certain terms which were employed at the meeting of the British Association, by men from whom one is justified in expecting better things. First, and worst, is the introduc-

tion of the term "Electromotive," as an abbreviation for the phrase "electric locomotive," by no less an authority than the President of the Engineering Section. We cannot understand on what grounds this unwelcome innovation can be supported. The word is an adjective in common use in technical phraseology; if it were employed in conjunction with another word, as "electromotive engine," it might pass, but by itself—! We feel sure that Dr. Kapp on reflection has repented of this fault; and happily we are certain that the usage will never come into vogue.

Next take "electrocute," used by Prof. Morris with reference to accidental death by electric shock. This word was coined by American newspaper men to designate execution by electricity—base coinage, indeed, for etymologically the word is execrable; like its congener "electrolier," it is a bastard, and has no right to live. However, it has been forced upon the language and must be tolerated; but let us try to restrict it to its true meaning—the execution of a *criminal* by electric shock, a penalty which is reserved for murderers. Again, in the title of one of the papers appears the phrase "Trades Unionism." So far as we know, "Trades Unions" is the only phrase in the language in which an adjective is given a plural form. It is, of course, entirely wrong, though it is often met with in the daily Press; but in the case referred to above there is not even the excuse of a plural noun. Lastly, we once more protest against the use of the symbol $\sim$ in formulæ. A symbol *must have a name*—a fact which is sometimes overlooked. When we read $2\pi f$ we say two pi eff; when we read $2\pi \sim$ we say two pi—what? two pi cycles? If so, should we read $I = E/R$ as "amperes equals volts divided by ohms"? Let it be remembered that symbols are symbols—not quantities, nor yet the names of quantities; and signs such as $^\circ\ '\ ''\ \sim$ should never appear in formulae. Space forbids us to animadvert upon the use of the monstrosity "dynamotor," the superfluity of "motorman" when simply "driver" is meant, and other abuses of the English language; we hope that all such matters will be dealt with in due course by the International Electrotechnical Commission.

The Chester Hydro-Electric Plant.

Elsewhere in our pages this week we illustrate and describe the new water-power plant, which, through the instrumentality of Mr. S. E. Britton, the city electrical engineer, has been installed at Chester, on the site of the Old Dee Mills. The scheme is the only one of its kind in this country dealing with both tidal and head waters, and, so far as we are aware, the Chester plant and that at Worcester are the only municipal hydro-electric installations in Great Britain.

It is generally assumed that the conditions in this country do not lend themselves to water-power development, but while this is apparently true as regards large powers, which the Snowdon plant of the North Wales Power Co. and the Loch Leven installation of the British Aluminium Co., are the only examples, there are numerous small water-power schemes for electric lighting in various parts of the kingdom.

Probably the rivers of North Yorkshire can show more of these small plants than any similar area, a dozen or more being in operation, for lighting remote villages and townships on the banks of the Ure, Wharfe, Swale and their tributaries.

The Chester scheme is, of course, much larger than any of those last mentioned, as 1,100 B.H.P. of plant is installed. The proposal received most careful consideration at the hands of both Mr. Britton and Mr. Hurtzig; and although it is too early to say anything about actual results, there seems to be little doubt that the venture will turn out to be a profitable one to the Corporation.

Australian Trade.

We have received from the Secretary of the Australian Association of British Manufacturers and their Representatives, in Melbourne, a printed sheet giving an outline of Australian trade in the year 1912. The figures given show the trade of the United Kingdom, Germany, and the United States, with Australia, and have been compiled by H.M. Trade Commissioner in Melbourne. The total imports into Australia (including bullion and specie) in 1912 amounted to £78,158,600, an increase of about £11,300,000, as compared with 1911. As showing the rapid growth of Australia as a buying market during the last few years, it is interesting to note that the imports in 1912 showed an increase of about £27,000,000, or well over 50 per cent., as compared with the imports in 1909.

A portion of the trade of Australia, however, consists of goods which, for natural reasons, the United Kingdom is unable to supply. According to calculations made by H.M. Trade Commissioner, the value of goods of this class which may fairly be deducted from the total in order to arrive at our share of the competitive imports was, in 1902, £15,009,110. The items thus eliminated consist of such goods as oils, ores, rice, foodstuffs, &c., and the balance of goods in which we are naturally capable of competing was £61,230,761, as compared with £52,295,529 in 1911 and £40,417,636 in 1909.

It is satisfactory to find that after a slight relapse in 1911 our share of the trade has advanced in 1912. In the latter year, the imports from the United Kingdom amounted to £38,317,485 (62·58 per cent. of the total), as compared with £32,140,488 (61·45 per cent. of the total) in 1911. While the proportion from the United Kingdom in 1912, compared with that in 1909 decreased by 1 per cent., yet in value our trade increased by £12,600,000, double the combined increases made in their trade by Germany and the United States, and more than £4,250,000 in excess of the increase in the imports from the whole of the rest of the world.

The second part of the statement now before us shows the imports into Australia of the chief classes of goods. The imports of manufactured metals amounted in value to £12,213,692, of which we took £8,303,040 or 68 per cent., to Germany's 12·5 per cent. and United States' 15 per cent. In machinery, the total imports were £4 771,397, of which our share was £2,510,052 or 52·61 per cent., as compared with Germany's 5·9 per cent. and United States' 31·6 per cent. It is obvious, therefore, that the United States is the competitor most to be feared in these lines and particularly in machinery. A good deal of her success had been due to very efficient selling methods, which, however, are now being more and more adopted by our own firms with beneficial results. Turning to the 1911 figures in the metals and machinery trade, we find that a large increase has taken place in the British share of the trade. Even where there is an increase in German and American trade, the increase is small, and in some branches there are actual decreases. The following figures are of interest as showing our share of the trade of each State in manufactured metals and machinery, and therefore our relative strength or weakness in the different parts of the Commonwealth :—

	U.K. share of total trade in— Manufactured metals.	Machinery.
New South Wales	65·4	48·9
Victoria	66·4	47·1
Queensland	71·2	61·8
South Australia	74·4	47·2
West Australia...	70·5	73·6
Tasmania	71·0	66·0

While we appreciate the usefulness of the figures now before us we should, from our own point of view, like to see them drawn up in greater detail to show more clearly what is happening in the electrical trades. Nevertheless, even in this general way it is interesting to follow the course of events in such an important market as Australia, and we hope that the Australian Association of British Manufacturers will continue to circulate the annual figures. We understand that the Association, which was founded by Mr. Hamilton Wickes when he was Trade Commissioner in Melbourne, is doing valuable work in other directions in the

interests of British trade, and we commend it to the notice of our manufacturers who are in any way interested in the Australian market.

Lead.

The market, since we last referred to the matter, has passed through another of its phases of weakness, which again was followed by renewed vigour, but as has been remarked in previous articles, it really seems as if the apex of the movement had been reached some time ago, when the price went to close upon £24 a ton. The recent weakness was the outcome of private cables from Mexico announcing that the resumption of shipments from the big smelter at Torreon was impending. This news leaked out somehow, and there was a certain amount of realising on the strength of what was regarded as a most important alteration in the position, but the news proved in the end to be premature, and in sober fact no lead has yet been shipped from the smelter named, while later developments make it more uncertain than ever when things will settle down to an extent sufficient to enable a start to be made with industrial operations. The Torreon smelter indeed has been the scene of sanguinary fighting again. It was in the occupation of the Federal troops, but was betrayed into the hands of the rebels, who swept through it with the rifle and bayonet, and they, in their turn, are being pressed by a large body of Federal soldiers, and in the impending struggle much damage to the plant may be done. Hitherto the rebel forces have not gone in for the destruction of private property, contenting themselves with taking whatever they required in the shape of supplies, and paying for them in paper money, which may or may not be useless. At any rate, the fresh trouble at Torreon sets back the clock again as far as the re-entry into the European market of Mexican lead is concerned. The news naturally had a stiffening effect upon prices, but the main cause of the temporary sharp advance in the price of immediate delivery, was the covering of the extensive bear account. The bears have been looking so long for the collapse of the Mexican fighting, and the resumption of normal industrial conditions there, that they refuse to cover their open commitments till the very last moment. This was the case on this occasion again, and under the pressure prices rose sharply. There has been quite a good demand for lead for export, one or two considerable lines being booked by South America, while the Russian market has been a continual buyer of fairly large quantities, and even yet there seems to be business to be done for this market. The Far East is also taking a good deal of material direct from Australia, and this tends to keep lead out of the London market. Consumers in Great Britain are undeniably short of lead and within the last few days one or two of the largest cable people have been literally begging for even 25 tons to keep their plants going. There is not the slightest doubt that the position of lead is actually very strong, but these are not times for the opening up of bull commitments on anything like an elaborate scale. There is a feeling of distrust about, and this is acting as a marked restraining influence upon enterprise in all directions, and lead is not likely to escape from the common experience. At the present price and with indications on nearly all sides of a trade recession being in progress, consumers are not likely to operate in advance of their known needs. Hence the stocks which they are holding in their yards are very small, probably less than for many years, and this is a factor which, were outside considerations less uniformly unfavourable, might count for a very great deal, but as it is the predominant note is pessimism. As with copper, all intrinsic conditions are disregarded, but some of the leading dealers and brokers are very confident, and point out that export contracts are behindhand owing to the inadequacy of supplies, while important electrical consumers are begging for metal. It is pointed out, too, in one prominent quarter that lead can hardly become plentiful under existing circumstances. The world's output has only increased 3½ per cent. in the last 10 years, while the consumption for electrical purposes has increased enormously.

ELECTRIC COOKING FOR THE SMALLER CONSUMER.

[COMMUNICATED.]

At present the consumer having an income of between £200 and £300 a year finds that electrical cooking is rather beyond his means. This type of consumer is so numerous, and is generally so prompt in meeting his accounts, that on those grounds alone he is well worth cultivating. There is, however, another very important point to consider—the question of load factor. At the moment, any engineer having a fair number of cookers on his mains will assert that the addition of the cooking load has not increased his winter lighting peak; he can also bring forward load curves to prove this point. Now it seems to be quite lost sight of by many cooking enthusiasts, that the possible cooking load, even amongst the wealthier classes, has not yet been tapped to any extent; true, the output has increased on this account quite respectably, but a cooker for any size of family takes a good deal of current, so that it does not require many large ovens on the mains to increase the output. The state of affairs at present is somewhat as follows:—Several people have cookers in use, but it will be found that they are few enough to make it fairly certain that as one oven goes off another comes on. This is due to the fact that the times of dining, and, therefore, the times of preparation of the food vary considerably. With comparatively few of the late-dining class using ovens it is easy to see how the total load demanded by the cookers will not badly affect the load factor. When, however, the use of the electric cooker becomes general amongst this class, as it shortly will owing to its many advantages, it will be found in every locality that there is a time which may be described as the general dining time for that district, and quite 80 per cent. of the people concerned will be dining about that hour. This load, if of any magnitude, is bound to affect the peak at lighting times in winter. A large increase in this cooking load would mean the installation of additional generating plant to supply very low-priced units on top of the winter lighting peak.

If the smaller consumer can be persuaded to adopt electric cooking, then the fact that this class of consumer invariably dines in the middle of the day, coupled with further advantage that in the aggregate he will afford a much greater load than the former class, will result in the mid-day cooking load balancing to a great extent the cooking load which will come on during the lighting peak. A further advantage to be obtained from this consumer is that a good deal of his cooking will be done during the hours when the industrial motor-load is shut down for dinner time.

The chief cause tending to keep this consumer off the mains at present is almost solely the cost. It is freely admitted that this particular class of the community have much heavier calls on their incomes than any other class. No increase of cost for their heating or cooking can be entertained if there is not an equivalent cash saving in other directions. The advantages of electric cooking over all other methods as regards comfort, health, and even the less wastage in cooking joints will be unavailing to secure consumers from this class if the actual bills to be met are heavier than at present.

In a household known to the writer, the charges for lighting and cooking are as follows:—Gas for lighting and cooking, at 2s 6d. per thousand, £3 6s. In addition to this there is a charge of 2s. 9d. per quarter for the rent of the stove, which will cook the meals for a family of six; and a meter rent of 1s. per quarter. The cost of coal for warming rooms and heating bath and lavatory water is about £4 10s. net, coal costing 15s. per ton delivered. This latter item, however, is at the present time not under discussion.

The house is let at £23 a year and rated at £17; thus with a tariff on the Norwich system, of 10 per cent. and a halfpenny per unit, such a consumer could use 768 units a year for the same cost as he now pays for gas. As the saving in meat wastage in the house under consideration would amount to about 25s. a year out of a present annual expenditure of £15 on butcher's meat, we have by this

means a saving which will allow the consumer to use another 600 units a year. The total number of units used will then be as follows: 1,368 for both lighting and cooking of which 100 units will be for lighting. The total available for cooking is then 1,268 units a year, which is too low to carry out the cooking for a family of six. The only effective remedy which the writer can see for the problem is for the efficiency of the apparatus used to be considerably increased. The capital cost of the utensils must also be brought lower, so that they can be hired out at a charge which will compete with that made by the gas authorities. The price per unit can hardly be lowered at the present time, whilst on the Norwich system the substitution of half-watt lamps (if that were possible), for the present lamps would not reduce the annual cost to a sufficiently low figure to secure the class of consumer indicated. In catering for this class, it must be plainly realised that though the benefits of electrical cooking will be freely admitted, yet the extra cost, at present, cannot possibly be entertained. It may be urged that there will be some saving owing to its being possible to dispense with some amount of paid domestic help; this, however, is not the case, as the cost for domestic help in common with all other expenses must be kept down to the lowest possible; thus, the house is often run by the mother and daughters, and though they would be glad of the extra rest and pleasanter kitchen conditions offered by the use of electrical cooking, yet they are forced to forego them on account of the extra money not being available. Where help is employed, it is often because the family consider certain duties in the house as being beneath their dignity; and in these cases it is obvious that such duties will not be affected by the introduction of electrical cooking.

This class of consumer is a most desirable one for the cooking load; he is also more than ready to use electricity for this purpose if it were not for the present cost being rather higher than for existing methods. The station engineer should make a strong point of urging on the manufacturers, in season and out of season, that they must design a cooking stove which is considerably more efficient than those at present available. With so rapid an extension of electrical cooking amongst the class who dine late, the manufacturer is at present busy, and will not be inclined to listen to demands for a more efficient article, which will probably scrap a good many of his present patterns; but the station engineer must either get a cooker which will allow the smaller consumer to use electricity for cooking, or be content to see the cooking load grow and become concentrated on the worst hours of the winter lighting peak.

The obtaining of the smaller consumer's cooking load will not only increase the profits of the supply company, but will practically wipe out the loss of revenue which will have to be faced when the ½-watt lamp is available in 50-c.p. or lower units. With a good cooking load of the type indicated above, the coming of the ½-watt lamp to those towns using the Norwich system will cause little anxiety.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Sale of Electric Lamps.

We take this opportunity of drawing the attention of dealers in electric lamps to the obviously unfair methods of the wholesalers in supplying private consumers with lamps at the same price, and in some instances even less than supplied as per catalogue price to the trade, less, of course, the usual discount allowed the trade. We have experienced considerable difficulty in instances resembling the following:—

Firms of repute have offered to supply us with their goods at a certain price equal to their catalogue price, less trade discount. They have then followed up by sending a representative into our immediate vicinity, who offers the same goods at the same price as offered us, less a further 5 per cent. for cash, having no regard to their listed prices.

How then can we expect the public to purchase the goods from us when able to deal to greater advantage with the wholesaler? The trade is thereby put on a level, as regards price, with the consumer.

We shall be glad to hear the views of other dealers and to know if they have experienced the same trouble.

The Electrical Accessories Supply Stores.
R. JENNER, *Proprietor.*

Sheerness, *October* 10*th*, 1913.

An Echo of the Marconi Contract.

I find your issue of September 19th awaiting me here.

Against my statement to you that the War Office Wireless Committee had no relation of any kind whatever to the Marconi contract or to my visits to long-distance wireless stations, and that nobody but yourself had ever thought of attempting to make any connection between the two, you quote a telegram from the *Times* to the effect that on the homeward journey from Vienna the War Office "party would visit the Goldschmidt station near Hanover and the station at Laeken," and you ask "How can he maintain that his visits were totally unrelated to the Committee, of which he was chairman?"

The explanation is perfectly simple, as a little courtesy to my personal statement regarding myself would have enabled you to guess.

The *Times* correspondent was inaccurate upon this point. My colleague of the Committee, and the Army expert who accompanied us, returned straight to London from Vienna, as our work there for the Committee was done; and I proceeded alone to Berlin, Hanover and Brussels, on purely private visits, privately arranged by myself, with which the War Office and the Committee had no more to do than you had. Long-distance wireless was wholly outside the scope of the War Office Committee, and my private visits to, and observations of, these three important long-distance stations —Telefunken at Nauen, Goldschmidt at Eilwese, and "onde unique" at Laeken—were never reported to the Committee, or considered by them for a moment. The two matters, as I assured you, and as you might courteously have believed without further challenge, had absolutely nothing whatever in common.

Second, I told you that I had never said I have "seen every long-distance station in operation," or that I "knew every big station in Europe." Against my denial you quote the necessarily condensed report of the *Times*, and remark, with your customary courtesy: "Let him reconcile this with his other statements—we cannot."

In final reply I send you the official verbatim report of my speech, from Hansard's Parliamentary Debates.

On page 4 you will find the first remark: "I have had the opportunity of seeing *every type of* long-distance wireless station in operation."

On page 2 you will find the second remark. I was criticising Mr. Churchill's statement that "this country has been deprived of advantages in wave-length," &c., and I said: "I believe that I know *the wave-lengths of* every big station in Europe."

This letter concludes the matter, so far as I am concerned. But I will cherish the hope that you will at least have the courtesy to express regret for your repeated misrepresentation of me.

Henry Norman.

Antibes, France, *October* 5*th*, 1913.

[As we have stated on previous occasions in connection with this matter, we relied upon the *Times* reports for the information upon which we based our allusions to Sir Henry Norman's contributions to the Marconi contract controversy. Sir Henry now, for the first time so far as we know, denies the accuracy of those reports in important respects, and, of course, we accept his statements. We had no desire to misrepresent him, and regret that we were misled by the reports in question into ascribing to him statements that he did not make.

What we objected to was the assumption that minutely examining and taking copious notes of wireless installations, and running one's "own little station," constituted qualifications for posing as an authority on long-distance wireless telegraphy, and in that respect our attitude is unchanged.—Eds. Elec. Rev.]

The Diesel Engine.

I was very much interested in the abstract, contained in your current issue, of Mr. G. S. Taylor's report on the Bray explosion. As we depend entirely on Diesel engines for our output, I am naturally always on the lookout for information which will improve my knowledge of the inner working of these engines. I, therefore, obtained a copy of the full report and studied it carefully, and would strongly recommend every engineer who is responsible for the efficient working of Diesel plant to do the same, as Mr. Taylor has treated the subject in a very exhaustive and excellent manner. In view of the widespread interest in Diesel engines, I may be excused for commenting on some of the details in the report; I do so, of course, not because I have the slightest inclination to criticise the methods which were adopted at Bray when starting up the engine on the occasion reported on, but because if any error of judgment were made on this occasion, others, like myself, no doubt would wish to ascertain all that can be learned of the circumstances causing the explosion, with a view to taking precautionary steps to avoid the possibility of such an occurrence on other Diesel plants. Reverting to Mr. Taylor's report, the following facts are stated therein :—

1. The pressure in the starting vessel was only *slightly above* 350 *lb.*, when the compressed air and oxygen from this was admitted to the engine.

2. The pressure in the blast vessel when charged with the oxygen was 800 lb.

3. The fuel pump and the fuel pipe to the engine were drained of crude oil, and were primed with kerosene oil, prior to starting the engine.

4. The flash point of kerosene is between 70° and 90° F., and of crude oil, about 150° F.

When starting the engine, the following valves were opened :—

(*a*) Valve from blast vessel to fuel valve.
(*b*) Valve from compressor to blast vessel.
(*c*) Valve between blast vessel and pressure gauge, and
(*d*) Starting valve on starting air vessel.

The last-mentioned operation (*d*) set the engine in motion, and after the engine had made about six revolutions, the starting lever on the cylinder head was put into the running position. The report states that the explosion did not occur until some seconds after this lever was operated. It further states that no firing stroke occurred, and that air was leaking badly from one of the cylinder valves with a hissing noise (this is characteristic of a leak past the needle valve); also that the air inlet and exhaust valves were leaky. As the report does not state if the starting valve on the starting vessel was closed before the explosion occurred, one may assume that this valve was not closed.

In two respects the starting of the engine was not carried out in accordance with the instructions issued by the makers of the engine. First, the pressure in the starting vessel was far too low to enable the engine to get under way properly. (The makers recommend a normal pressure of 800 lb., and that no attempt should be made to start the engine when the pressure in the starting vessel is found to be less than 600 lb.) The second operation questioned was the opening of the valve between the blast vessel and the pressure gauge.

The usual procedure is to open this valve when testing the pressure in the blast vessel, and to close it again as soon as the pressure has been read on the gauge. The valve is then kept shut until the engine is firing and is properly under way, and is only opened while the engine is running, when one of the air vessels is being recharged to its normal pressure from the compressor on the engine.

Neither in Mr. Taylor's report, nor in any of the articles I read in the technical Press shortly after the unfortunate occurrence at Bray, did I notice any theory put forward as to what effect an abnormally low pressure in the blast vessel would have on the circumstances causing the explosion. Keeping in view the facts that the pressure in the starting vessel was extremely low, and that the air inlet, fuel, and exhaust valves on the cylinder head were leaking air, it follows naturally that the pressure in the blast vessel would fall very rapidly until, in a matter of seconds only, it became less than the maximum pressure of compression in the cylinder of the engine. Now, under normal conditions of working, the fuel oil is ignited spontaneously at the instant of maximum compression, and this ignition, of course, can occur only when the fuel oil is properly sprayed into the cylinder by the blast pressure. If, however, the blast pressure is too low to force the fuel oil into the cylinder, an excess of oil (in this case, kerosene) would accumulate in the fuel valve seating. The report states that the explosion originated in this latter, and explains very fully how this explosion probably occurred. In the circumstances mentioned, it seems, therefore, perfectly feasible to assume that the resultant vaporised oil was propagated through the blast pipe to the blast vessel at the instant that the needle valve was lifted off its seating by the cam lever.

The conclusion I arrive at is that the explosion was due primarily to an attempt being made to start the engine with an insufficient supply of air in the air vessels, and that if the pressure of air in these vessels had been adequate, probably no explosion would have occurred. This conclusion would appear to be supported by the fact that the same engine was successfully started by means of compressed oxygen only five months previous to the event in question.

Mr. Taylor concludes his report by recommending, *inter alia*, that only competent men or experienced engineers should be employed as attendants on Diesel plants. As this recommendation may prejudice the minds of would-be users of Diesel engines on the score of extra labour charges for skilled employés, I think it is only fair to the makers of these engines to state that this recommendation applies more to small isolated private plants, where probably the one man is responsible for everything in connection with the engine, than to, say, small central stations at which two or more Diesel engines are in use. In the latter case the chief engineer or his assistant keeps careful records of all the valves and other parts of the engine which require regular attention, and sees that these are attended to periodically as recommended by the makers. Any engine driver of average ability would very soon learn how to grind in and clean the valves, &c., but the proper setting of these valves should, in my opinion, be done only by the engineer or his assistant. So far as my own personal experience proves, the actual running of a moderate sized Diesel engine does not require the service of a skilled attendant in central station practice. We have three 3-cylinder Diesel engines operating here, and since these engines were first started 15 months ago, they have been driven by three local men who previously had never even seen a Diesel engine working, and whose experience when appointed had been limited to running small local gas or steam plants. These men were each given a fortnight's instruction in the working of the engines, and each man then continued his duties, and has carried them out for months, without a hitch of any consequence.

P. A. Spalding,
Engineer and Manager.

Electricity Works, Dundalk,
October 6th, 1913.

Ventilation at the Gas Exhibition.

What I would like to know is why, if gas lighting and heating are such useful methods of ventilating, have there been fixed, exclusively for the Gas Exhibition at the White City, 53 (there may be more hidden away) 30-in. electric fans, each capable of exhausting 8,000 cb. ft. per minute.

Now, if it is not necessary to have this installation of fans during the run of other exhibitions, when the ordinary ventilation is good enough, why is it necessary to spend, I assume, at least £2,000, solely for the purpose of ventilating the building, when gas is such a good means of ventilation?

Perhaps it is because there being no white ceilings for

the calcined microbes to stick to, or convenient porous plaster for their charred remains to ooze through, the managers remove the cremated bodies from the building into the pure atmosphere to ooze into the lungs of the passing crowd.

As likely as not "Electric Supply Memoranda" will give the reason. Will you ask him?—because I should like to know.

A. C. Bostel.

Croydon, *October 15th*, 1913.

LA MAISON ELECTRIQUE.

FURTHER visits paid to the Ideal Home Exhibition at Olympia more than confirm our first impressions regarding the value of the opportunity which the occasion affords for familiarising hundreds of thousands of people with the domestic uses of electricity by actual demonstration. It is true that the purely electrical stands are not numerous, but there are some excellent examples, well planned, well manned, and in every way creditable representations of electrical applications which are drawing great crowds of middle-class householders, and convincing them that the time is fully ripe for the electrical conversion of their domestic arrangements to take place. From the advance notes published respecting La Maison Electrique, our readers will have gathered that its contents were not to be prosaic or unattractive. Some cold, unimaginative creature has in critical mood suggested that workmen's cottages lighted by electricity would be more appropriate at such an Ideal Exhibition than a magic table. We do not agree. We believe that Monsieur Knap's electric dinner table is just now doing a very useful service to the cause of electricity, and as we have had occasion to offer some criticism of the Electric Supply Publicity Committee in the past, we now come with hurrying feet to offer our congratulations to them upon this part of the display organised in La Maison Electrique. Indeed, we do not limit our congratulations purely to this novel, and, considered from the householder's point of view, impracticable device, for the House is throughout attractive, and, as far as it is possible to make it so in a small compass that must be thronged with people, businesslike.

Of course, in this house electricity is used for everything. In the kitchen, the dining room, the business office, the bathroom and the bedroom, a hundred different applications are to be noted. All the water for the household is heated by electricity, and the revolving hair brush, hat iron, bath towels, and the bath mat are all heated by the same agency. In the business office there is an addressograph, a Burrough's adding-machine, and a Blick letter-sealer. Elsewhere there is an Ozonair apparatus, a "Universal" motor table (G.E.C.) with electric motors for boot polishing, knife cleaning and many other such services, electric irons, and an electric sewing machine. Without mentioning the different departments and their equipments in proper sequence, we may add that hair-drying and curling, cradle-rocking, food-warming for the baby, electrically-drawn curtains for the bedroom, and telephones, all play their part in this ideal home. The electric cooking and heating apparatus is rightly made one of its strongest features. Such apparatus includes the following: A Therol heater (Spagnoletti); a cooking stove (Westminster Electric Supply); a Cooper water heater, a grill and a potato steamer (Purcell & Nobbs); a warming cupboard, coffee percolator and table kettle (Metropolitan Electric Supply); a Bankside water heater (City of London E.L. Co.); a floor pad by Messrs. Holmquist; a Belling fire (Belling & Co.); a radiator and a Pygmy heater (Bastian Co.); a shell radiator (British Electric Equipment Co.); a coffee percolator, toaster, hot-plate and kettle (Townshend's Art Metal Co.); and a glue pot (the Electrical Co.). There are vacuum cleaners by Duncan Watson & Co., the British Vacuum Cleaner Co. and Gillespie & Beales; a table fountain by Messrs. Laing, Wharton; an electric fan (G.E.C.); a tea cabinet by the Afternoon Tea Cabinet Co.; an electric lift to carry meals, &c., to the bedroom, not to mention a fly-catcher and a lavatory set.

The exhibit of Messrs. Rashleigh, Phipps & Co. is the most prominently placed purely electrical one in the Hall, and it is well arranged with a lengthy frontage, allowing a very large number of visitors simultaneously to inspect the manufactures shown. The collection of electric light fittings is very choice and valuable. A special room is set apart for the display of inverted fittings in great variety, including the new "Superlux" system, and the effect here is most pleasing. Near one end of the exhibit an electric fountain is playing, and an electric clock is among the other features catching the public eye. Ozonair apparatus, Osram lamps of all sizes and candle powers, and a motor-driven sewing machine at work, are also shown, but the great attraction, which is undoubtedly doing much educational work, is the businesslike collection of electric heating and cooking apparatus. Demonstrations of egg-boiling and other operations on the breakfast table were in progress on the occasion of one of our visits, while ironers were busy showing the good points of the "Magnet" electric iron. In conversation with Mr. Archer, we were interested to learn that during the past nine months 22,000 of these irons have been sold by the makers mainly for service in this country. Demonstrations are also being given with various cooking apparatus on the Archer-Magnet system. One of these is a new domestic cooker, with air lagging. It has an 8-in. hot plate at the bottom, with two circuits controlled by a circular-pattern switch with high, low and off positions. At the top there is a griller attachment, with open red-hot coils supported on massive insulators. With this apparatus, which is specially arranged for flat use, grilling, cooking and boiling on top of the griller may be effected simultaneously; but we hope to publish further details of this cooker in due course.

"Kingolite" electric candles are in use at many stands in the Hall, including those of Messrs. Waring & Gillow, Rashleigh, Phipps & Co., Coal Consumers' Co., Daniel of Wigmore Street, Harvey Nichols, Edmundson's Electricity Corporation.

Messrs. Edmundson's Electricity Corporation, Ltd., show prominently an automatic, self-regulating plant for country house and other installations. They also have showrooms as part of the stand, where electric light fittings and cooking and heating appliances are displayed. The Dowsing Radiant Heat Co., Ltd., who, at many exhibitions, make a proud showing of their popular lines, which are always sure to receive a good deal of attention from the general public, display their luminous and non-luminous radiators, electric cooking apparatus, electro-medical appliances, electric light baths and so forth. The Linolite Co. exhibit their Woodhouse steel casing, "Tubolite" and other specialities.

Vacuum cleaners are to be seen in several parts of the building. The Electric Appliances Co., of Glasgow, show their "Imperial" vacuum suction cleaner, electric vibrators, &c.

The British Vacuum Cleaner Co., Ltd., have a large exhibit of British vacuum cleaners, ranging from the "Brivac" vacuum sweeper to a large stationary cleaner for central installation purposes in private houses, hotels, theatres, &c. For the first time there is shown a new electric cleaner (Model "F F."), which will sell at a moderate price. It is claimed that the machine is most efficient, while the weight is only 11 lb., so that it can be carried about by any servant easily, and can be rested anywhere, as on a staircase, while the stairs are being cleaned. The electrical cleaners include both fan and pump types.

Messrs. Magic Appliances, Ltd., show their new "Magic" suction cleaner, which was described in our issue of September 26th, and represents a great advance in efficiency and reliability compared with previous designs.

LARGE ELECTRIC KITCHENS.

THE great developments in the generation and utilisation of electrical energy during recent years, and the important reductions in the price at which it is sold, have led to the extensive use of electric cooking appliances of all kinds, and there have been established a number of all-electric kitchens in many hotels, restaurants, sanatoriums, steamships, &c. Apart from the great hygienic and economic merits possessed by electric cookers under all circumstances, and too well known to need recapitulation, the little space occupied by electrical equipment is often of great importance—particularly in city buildings and on boardship. In large manufacturing works, electric kitchens offer an ideal means of catering for the staff, and the energy consumed generally effects a very appreciable improvement in the load-factor of the total works demand.

In the Siemens-Schuckert Co.'s cable works near Berlin, an electric kitchen capable of providing for 200—300 persons was erected in 1911, the equipment including:—Eight saucepans of 31 quarts capacity, and consuming 4·2 KW. each; eight 13-quart, 2·6 KW. saucepans, and one of 5·3 quarts capacity (1·5 KW.); 10 pans totalling 16·6 KW. demand; one 2·6-quart kettle (1 KW.); one copper kettle and one coffee urn each of 31 quarts capacity; and one combination containing two roasting ovens, and two hot chambers (15 KW.). The maximum demand possible is 93 KW., but the average lies between 20 and 40 KW.

During one month (August) it was found that the average energy consumption per meal (of ½ pint soup, 6¼ oz. meat, 5½ oz. potatoes, 2½ oz. other vegetables, 0·075 pint milk, and 0·42 pint coffee) was 0·394 KW.-hour. With energy at ½d. per unit, electric cooking saved 10 per cent. as compared with the gas cookers used in the old cable works, but even with current at 1d. or more per unit, the higher cost of electric cooking is far outweighed by the incidental advantages secured.

An even more interesting case is that of the Norddeutsche Lloyd Co., who lately "electrified" the kitchen in their Bremen headquarters. For the supply of the lamps and lifts, &c., in the building, a private electricity station was already in operation, and as

the day load on this equipment was very small, the energy for cooking could be provided at from 0·2 to 0·3d. per unit (the cost of the fuel consumed).

The kitchen space is extremely limited, and before electric cookers were installed the conditions were almost unbearable in summer. Meals have to be cooked for 500 employés, who dine in three groups at one hour intervals. The electrical equipment installed includes: Five saucepans and five steamers, each of 44 quarts capacity and 6·5-KW. consumption; five 17·5-quart saucepans (3 KW. each), two of 13 quarts (2·6 KW.), and two of 9 quarts (2 KW.) capacity; four 14-in. steel pans (2·4 KW. each); three 70-quart kettles (8 KW.); two 44-quart copper kettles (5·5 KW. each); one combination containing four 30 × 18 × 11 in. roasting ovens (28 KW.); two hot cupboards each with four divisions (4 KW each); three hot plates each with two heats (4 KW. each); two hot tubes for the warm water tank (6 KW. each). The maximum possible demand is 194 KW., and the average 40-60 KW.

The equipment is so arranged that minimum hindrance occurs between the various cooks. In the centre of the kitchen a light concrete cooking table (fig. 1) is erected which is covered with glazed

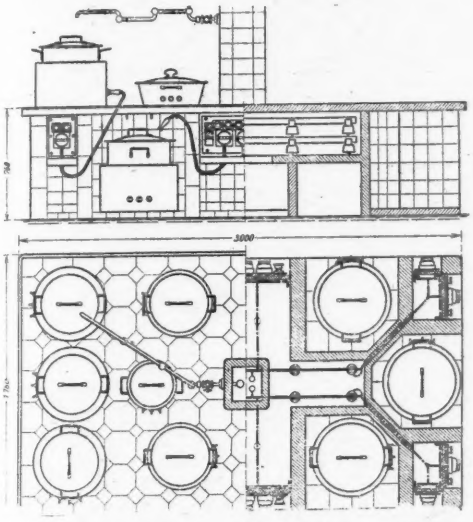


Fig. 1.—Elevation and Plan of Cooking Table.

tiles. Beneath the table are recesses for the accommodation of utensils not in use, and also the necessary fuse and switchgear, and distributing bus-bars. The supply mains are brought down a tiled duct, which also accommodates the hot water delivery pipe (terminating in a jointed discharge pipe). Twenty-six connecting points are provided on this table—14 for the large saucepans, fish kettles and pans, and 12 for the smaller utensils. Current is switched on or off plugs by switches mounted near the point at which the plugs are to be used; when idle, the plug flex is hung over hooks beneath the table.

The saucepans or boilers are double walled, nickel plated and provided with side and bottom heating elements as in fig 2. The

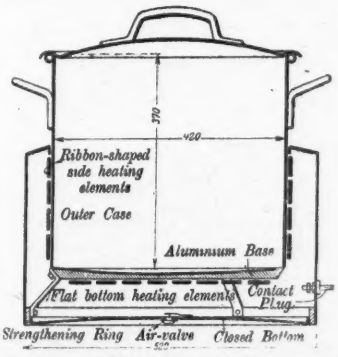


Fig. 2.—Saucepan with Bottom and Side Heating.

heaters are of pure nickel, or 20 per cent. nickel plated, and the vessels being in one piece, there are no joints to melt should they be allowed to boil dry. It is a difficult problem how to attach the bottom heating elements to thin-walled utensils. If soft solder be used the joint is liable to melt, and if the attaching screws are hard soldered, distortion of the bottom generally occurs quite apart from other difficulties encountered. Certain other arrangements which have been tried are subject to the objection that expansion is likely to cause defective thermal contact. In the Prometheus system, an aluminium plate is fitted to the bottom of the vessel (as in fig. 2). This plate is turned flat in order to make good thermal contact with the flat heating elements, which are attached to it by easily removable studs. Owing to its high conductivity, the aluminium hot plate distributes heat evenly over the bottom of the vessel. The side heating elements are clamped in place by small tightening screws, and the nickel plated outer shell is provided with a collar (soldered to the cooking utensil), and at the bottom is stiffened by a stout galvanised iron ring. To the latter are screwed struts, which are bolted on to the aluminium block, and which carry the greater part of the weight of the vessel and its contents. The bottom plate closing in the heater space is soldered to the iron supporting ring, and in it is a small air valve designed to prevent excessive air pressure in the space between the walls of the complete boiler. The various heating elements are connected in series-parallel and, according to the switch setting employed, 6·5, 3·7, 2·8, or 1·7 KW. may be expended in each 44-quart saucepan. The lowest heat (all elements in series), is employed to complete cooking after boiling point has been reached (55 minutes from cold, using full heat).

The stewing pans are constructed in a similar manner, the inner vessel being, however, of plain steel and heating being from the bottom alone. The large oval fish kettle has a 4-mm. bottom to which the 2-mm. side plates are riveted and soldered. The aluminium bottom plate is no longer required, owing to the considerable thickness of the steel bottom and the less importance of uniform heating of the latter. The heating elements are attached by hard soldered bolts, and the power consumption is 8, 5, 3 or 2 KW. (70 minutes to boiling point from cold when full). As in the potato-steamer, a perforated nickel loose floor rests on suitable legs, and is provided with hooks for removal.

Fig. 3 shows the construction of the roasting ovens; each compartment has 5-mm. side plates welded to 10-mm. floor and top plates, the advantage of this construction being that it is impossible for steam or other vapours to penetrate to the heating elements. Each oven unit can be removed complete with its heating elements by the withdrawal of a few screws. Heaters are attached above and below each chamber by studs which do not, however, penetrate the top and bottom plates. Each under-element requires 4 KW.; each upper one 3 KW. and 2/3 or 1/3 full heat can be employed as

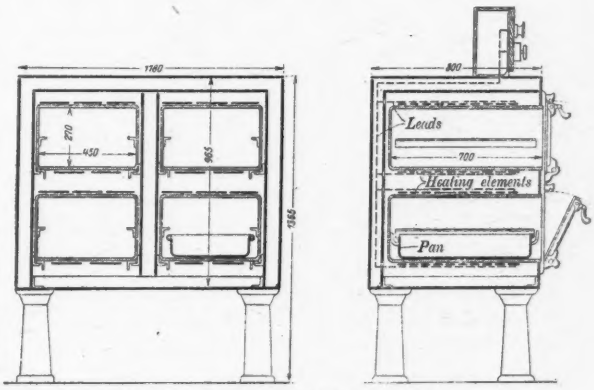


Fig. 3.—Electric Roosting Ovens.

required. On full heat, the oven can be brought to 240° C. in about 30 minutes: thereafter, the lowest heat suffices, and according to the class of cooking in hand, either the upper or the lower elements are most heated. The balanced doors can be left more or less open to permit the escape of steam, &c. The main shell is white enamelled and the attachments are nickel-plated. Four sets of four switches are mounted on a switchboard above the oven, as shown, and thence bare bus-bars are carried between the double walls to the various heating elements.

The hot cupboards (for crockery and cooked food, &c.) are provided with enclosed heating elements beneath the shelves (which are readily removed. Each section requires 1 KW. (max.), and heating is regulable in three stages; 100° C. can be reached from cold in 40 minutes on full heat.

For the preparation of sauces and small quantities of special dishes, three double hot plates are provided. Each consumes 2 KW., and is heated by six silundum rods mounted beneath a slotted grid.

Two 44-quart (5·5 KW. regulable) copper kettles are mounted in a window recess, and from them boiling water is led into a coffee infuser. The prepared coffee is kept hot for as long as may be necessary by electric heat.

A 220-gallon tank erected above the kitchen supplies all the hot water required for cooking and washing purposes, at 60°-80° C. This is provided with a worm, and the original coal-fired circulating heating system is now replaced by two 6-KW. electric circulator hot tubes mounted immediately below the ceiling, and rendering available for other purposes the space occupied by the original coal-fired boilers.

The entire replacement of the original equipment was effected during the Easter holidays (Friday to Monday inclusive) this year. The kitchen staff quickly became accustomed to the electrical apparatus, and no hitch in the working of this important department has since been experienced.—*Elek. Zeitschrift.*

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

London-Made Electric Fittings.

We recently paid a brief visit to the premises in Whitfield Street, just off Tottenham Court Road, of Messrs. Abercrombie & Son. Our mission was to see in the showrooms at No. 36 some of the designs of Adam style electric fittings and metal work that were being produced in the workshops at No. 34, but we had not thought to stumble upon a mine of such interest and value as we found in the different rooms, and especially in one apartment on the top floor, where the work of skilled craftsmen of other days remains as a legacy in the business. Here, as far as possible, are classified the very large collection of actual models dating back, in some cases, nearly a couple of centuries. The Abercrombie business began its operations in the year 1720, and its record for choice work is visible on every hand. The fact that in 1794 the company first supplied the Brothers Adam with some of their original work is distinctly

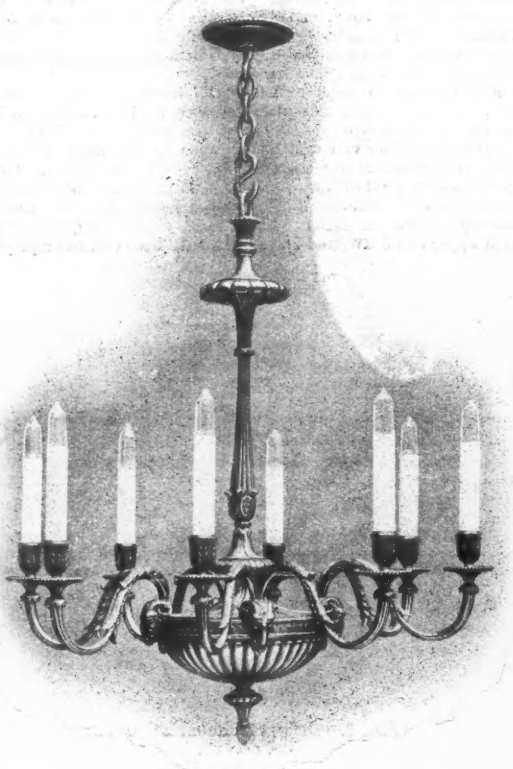


Fig. 1.—An Abercrombie Candle Fitting.

interesting. The premises are divided off into several departments, door furniture, cabinet handles, &c., predominating in one showroom, while in another are displayed a number of Adams electric light fittings, and this design being specially suited to candle-lighting. most of the specimens shown are fitted with the latest form of Lux electric candle with metal-filament lamps. Mr. A. A. Barron took over the business entirely some three years ago, though his connection with the firm of Abercrombie & Son dates further back than that. All the work shown is cast, and a strong feature is made of high-class chasing. The whole of the firm's business is done through the trade, and contracting, supply, and other firms take their clients to Whitfield Street to make their selection. Modestly away in one corner of the showroom we observed a new patent ventilator, invented by Mr. Barron, by means of which ventilators can be opened at a distance by electric control, but of this we shall publish particulars later.

New Low-Tension Arrester.

Messrs. Isenthal & Co., of Denzil Works, Neasden, N.W., have introduced a new type of electrolytic lightning arrester for circuits below 600 volts, which cannot be adequately protected by spark gaps owing to the narrowness of the gaps that would be necessary. In the new device, the principle of the aluminium arrester is retained, but the voltage which is applied to the film of oxide is reduced to one or two volts, the charging current is reduced to a minimum, and the arrester may be kept permanently on an A.C. line without heating up, and without the interposition of gaps in the circuit. These advantages are obtained by making the electrode in the form of a chain, of which each link is electrically separated by two oxide films from the next link, the total resistance of the chain being therefore very high. The chain, which is about one metre in length, is threaded through a cork-screw channel in the mass of a porcelain insulator, which is filled with the electrolyte—a mixture of pure glycerine and water. The chain thus occupies the minimum space, and cannot become entangled. On an outer insulator is wound in a spiral groove a tinned copper cable, which

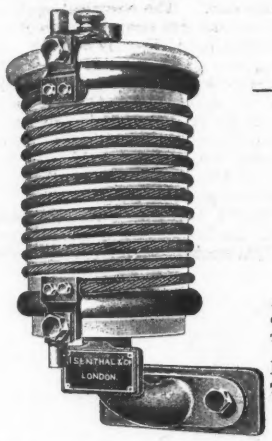
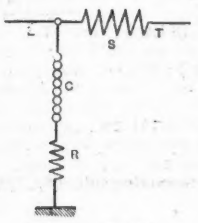


Fig. 2.—New Low-Tension Arrester.



L, line; S, choker; C, chain; R, resistance; T, to transformer.

Fig. 3.—Connections of Arrester.

forms a choking coil. The apparatus is very compact, and can be mounted in the open; it weighs 13¾ lb. for currents up to 50 amperes. Fig. 2 shows the exterior of the device, and fig. 3 the connections.

Tower Wagon for South Shields.

By the courtesy of Mr. W. T. Robson, general manager and engineer of the South Shields Corporation Tramways, we are enabled to show the accompanying illustration of the tower wagon

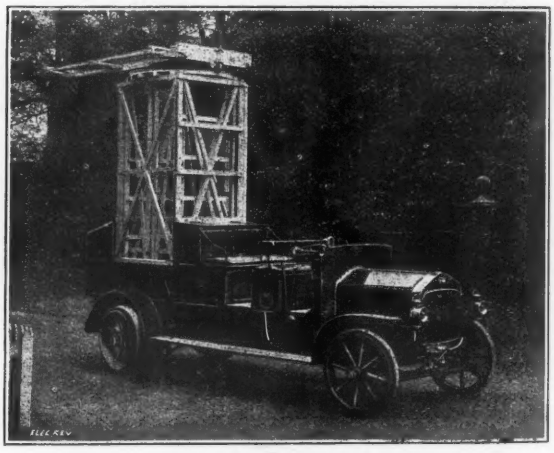


Fig. 4.—Tower Wagon for South Shields.

recently purchased by that undertaking. The chassis is a 32-H.P. Albion, and the body was built by Messrs. Rawlinson & Son, of Blackburn.

Electric Clock Movements.

Mr. C. H. Davies, of 1, Nursery View Villas, Whitton, Middlesex, recently took out a patent for improvements in electric clock movements, which is of considerable interest. There are numerous spring-driven clocks of excellent quality, which the owners would willingly convert to electric drive if a simple method of conversion

Fig. 5.—Section of Spring Drum.

were available, without discarding the bulk of the clockwork, and such a method is provided by Mr. Davies's invention, though it is not restricted to this purpose.

A difficulty met with in electrically winding clock springs is that of overwinding. Mr. Davies uses a small motor of very simple construction, geared by worm and wheel to the drum containing the spring; but instead of attaching the outer end of the spring to the internal wall of the spring drum, he leaves it free. The

pressure of the spring against the drum is amply sufficient to drive the clock train, and if the speed of the motor exceeds that necessary to keep the spring wound, the spring simply slips inside the drum, acting as a friction clutch. The gear can easily be applied to existing clocks, or can be used to drive the first, second or third wheel of a clock movement. The little inductor motor takes 0·01 watt, and can be supplied with energy from dry cells. On this system the pendulum or balance wheel is left entirely free to perform its duty of regulating the speed of the clock movement, having no electrical contacts to make.

W. & G. Electric Novelties.

Messrs. Ward & Goldstone, of Sampson Works, Salford, Manchester, who have long been known as manufacturers of a large variety of electrical accessories for lighting and power and various other purposes, have in their newly-issued catalogue of electrical novelties included a host of things in which the electrical supplies or shop counter man is interested. Massage apparatus, medical coils, electrodes, vacuum tubes, wireless telegraph sets, Morse writing apparatus, alarm clocks, pocket and hand lamps, accumulators, miniature and other metal-filament lamps, electric motors, electric horns and electric fountains—these we mention merely for the purpose of indicating the general scope of the catalogue

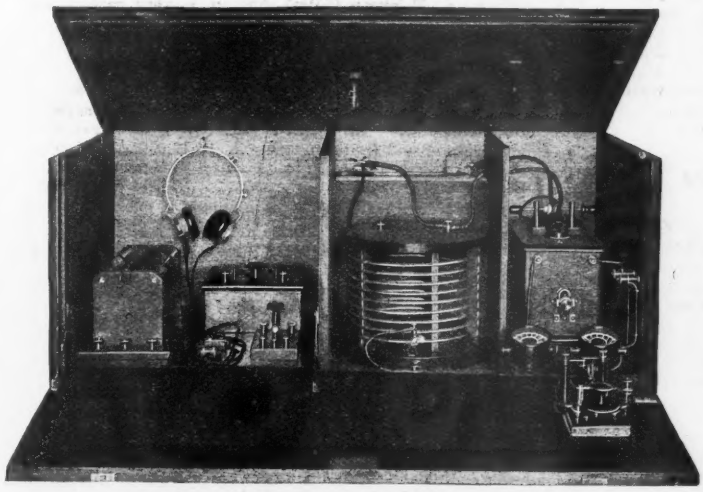


Fig. 6—W. & G. Wireless Receiving Station.

(70 pages), but there are many sundries, ranging from a complete wireless receiving and transmitting station, to toy electric light fittings for children's doll's-houses. We select for illustration here (fig. 6) one of their wireless receiving stations, which is made at a popular price, under Marconi licence. In fig. 7 we show the "Voltalsie" self-regulating electric cycle lamp, which gives an

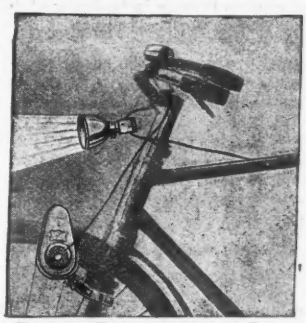


Fig. 7.—Electric Cycle Lamp.

equally brilliant light at walking or racing speed. It has an 8-volt metal-filament lamp. The same lamp is also made suitable for motor-cycle service. The arrangement is driven by a small rubber-tired wheel which works on the rim of the cycle, and adapts itself automatically to any unevenness of the rim. By touching a lever the generator can be put in and out of contact as desired.

Brass Nut Cover.

Messrs. Robert Bowran & Co., Ltd., of 4, St. Nicholas' Buildings, Newcastle-on-Tyne, has sent us samples of the "Nesbitt" nut-cover, a stamped brass box which fits closely over a steel nut, and protects it from corrosion. The device is intended to secure the same result as a brass box nut, but whereas the latter is in most cases too expensive to be used, the "Nesbitt" cover costs but a trifle, and is easily applied. The steel nut is first treated with boiled oil, tallow, or other protective coating, and the cover is then immediately applied; as it covers the end of the bolt as well as the nut, it protects the thread from corrosion, so that the nut will not rust to the bolt, but can be removed with ease after any lapse of time.

Witton-Kramer Pedestal Grinder.

For grinding castings, for sharpening tools, and a host of other similar purposes, the self-contained electric pedestal grinder is of the greatest utility in a busy engineering shop. A tool of this description is now being manufactured in quantities by the Witton-Kramer Electric Tool and Hoist Co. (for whom the General Electric Co., Ltd., 67, Queen Victoria Street, E.C., are the sole selling agents). It consists of a 2-h.p. totally enclosed motor, with bearings of extra length and spindle of large diameter extended at either side to carry grinding wheels. The spindle is solid, and is not an ordinary motor spindle with extension pieces driven in. The motor, which may be of either the three-phase or continuous-current pattern, is controlled by a small ironclad switch, which is conveniently accommodated inside the pedestal, and can be operated through an aperture in the casting. The wheels are effectively protected by means of sheet-steel guards. Tool rests are provided which are adjustable in several directions. The machines are designed on very substantial lines, to enable them to withstand rough treatment.

New Continuity Fittings.

Messrs. The Steel Tubes and Conduits Co., of Alice Street Works, Keighley, have put on the market a series of patent grip

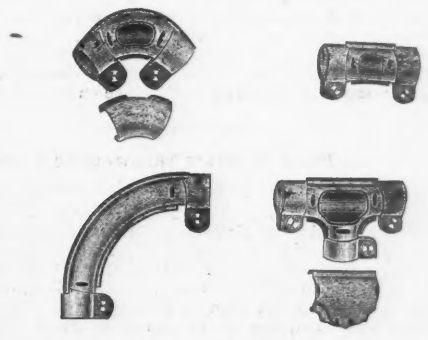


Fig. 8.—"Stacc" Steel Continuity Fittings.

fittings called the "Stacc" system, which are specially adapted for use with plain light-gauge conduits or tubes, it being claimed that an exceptionally high percentage of conductivity is obtained. Independent tests show the average conductivity of a T-joint to be over 80 per cent.; tests of an elbow similarly show 77 per cent. The fittings grip the tube all round, without cuts or loose pieces, and, being made of steel, they have a smooth interior, which cannot damage the cable like castings. Fig. 8 shows some examples of the fittings.

The "L B" Steam Trap.

Messrs. Ferguson Superheaters, Ltd., of 11, Queen Victoria Street, London, E.C., are introducing a steam trap for which special advantages are claimed. The trap consists of a copper or brass tube A, fig. 9, with a valve at one end fixed to a frame B. The inlet end of the tube is formed with a V-shaped projection C, which butts against the frame B. To the valve end of the tube an adjustable inextensible rod D is attached, this rod being connected to the frame by a thumb-screw E. When steam enters the tube this expands, and, being restrained by this rod D, the end of the frame is forced down until it engages with the top of the valve spindle and closes the valve. When the condensed water enters, the tube contracts and

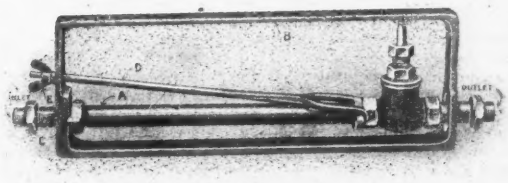


Fig. 9.—"L. B." Steam Trap.

raises the valve, and the water is discharged. The valve is easy of access, and can be taken out and examined in a few minutes. It is entirely water sealed, the sensitive action closing the valve before the whole of the water escapes, and thus diminishing the objectionable feature of valve cutting. In the "L B" trap there is no strain on the tube, as in types where the tube is fixed at one end. The trap will work in any position, requires no bolting down, and will discharge the water to a limited height. There are no internal working parts or internal springs which are liable to corrosion, and when in operation all the movements can be observed, every part being in view. It can be applied as a regulator for controlling the steam supply to feed-water heaters, calorifiers, jacketed pans, &c.

LEGAL.

Electric Wiring Prices.

On October 9th, in the West London County Court, Harraway Bros., electricians, 146, High Street, Kensington, sued Cicograni Smart, hairdresser, 142, High Street, Kensington, for £11 5s., for work done and materials supplied.

Plaintiffs' Counsel said that the defendant had had a new shaving saloon 12 ft. square × 8 ft. added to his present premises, and he asked the plaintiffs to run the electric light into the place from the main rooms. Nothing was said about the costs, and when the work was completed and the account presented, the defendant agreed all the items except two, which amounted to £4 15s.

Plaintiff said that he was not asked as to the price of the work, and completed it in record time, 56 hours. The charges were reasonable.

His Honour: Was there any contract?—Plaintiff: No.

His Honour: You say Mr. Smart asked you to do some electrical work, electric lamps and pushes?—Plaintiff: Yes, and when I sent in the bill it was not disputed, except two items.

His Honour: Does he say that you have over-charged him?—Plaintiff: Yes, he says the £4 15s. should be about £1 or £1 2s.

After further hearing of the case, H. Bonner, electrical engineer, said he had looked at the work, and thought 15s. enough for each light, and 5s. for each plug. The lights and plugs were placed on opposite sides of the room, and they might have been placed on the same side and so have saved a good deal of wiring.

His Honour gave judgment for the defendant, with costs.

La Plata Electric Tramways Co.'s Action.

[*Claim for* £10,000 *against Auditors.*]

In the Court of Appeal on Tuesday, Lord Justices Vaughan Williams, Buckley and Kennedy had before them a case involving a claim of £10,000 damages brought by La Plata Electric Tramways Co., Ltd., of Moorgate Street, E.C., against Mr. Thomas Benjamin Davis Fowler, of Clifton, Bristol, and Mr. V. G. G. Scroggie and Mr. T. E. C. Fowler, both of Buenos Ayres. The matter came before their Lordships on an appeal by the defendant Scroggie from an order of Mr. Justice Scrutton, in chambers, refusing to set aside a writ which Mr. Justice Bankes, on an *ex parte* application, had directed should be served upon the appellant out of the jurisdiction, in the Argentine.

Mr. Hugo Young, K.C., who (with Mr. E. G. Kimber) appeared in support of the appeal, said that the three defendants were partners in a firm of auditors in the Argentine. The firm carried on business entirely in that country, while the work of auditing the plaintiff company's books, in respect of which the present action was brought, was performed out there. In 1909 Mr. T. B. D. Fowler retired, and ceased to take an active part in the business of the firm, taking up his residence permanently at Clifton. There was, however, some question as to whether the dissolution of partnership was properly carried out, so that it was possible in point of law that the retired partner might be liable as a partner. The plaintiff company alleging that it had been defrauded to a very large extent by one of its own officials, brought the action against the defendants as auditors of the company's books, claiming £10,000 damages. The company contended that had the auditors exercised due care, the fraud might have been prevented. Having issued the writ in the action, the company served it upon Mr. T. B. D. Fowler, at Clifton, and then applied to Mr. Justice Bankes *ex parte* for leave to serve it upon the other defendants out of the jurisdiction.

Lord Justice Kennedy: You admit that the circumstances were such that Mr. T. B. D. Fowler could be sued for the acts of his partners?

Mr. Hugo Young: Yes. Continuing, counsel said that Mr. Justice Bankes upon reading an affidavit in support of the application, gave leave to serve the other partners out of the jurisdiction. His (counsel's) submission was that the affidavit upon which the leave was granted, omitted to set out all the material facts, and that had all such facts been stated, it would have been apparent that the cause of action arose in the Argentine Republic, that the decision of the case must depend upon the law of that country, and that the action could be more conveniently tried there.

In reply to the Court, Mr. Hugo Young explained that the present appeal was against the refusal of Mr. Justice Scrutton to set aside an order for service so far as Mr. Scroggie was concerned. As to Mr. T. E. C. Fowler, a question had arisen as to whether he was a British subject, and the application, so far as it referred to him, was at present standing over.

Mr. Holman Gregory, K.C., in opposition, pointed out that the registered offices of the plaintiff company were in London, as also was the directorate, and that one of the defendants was permanently resident in England. There was an affidavit to the effect that a trial in England would be cheaper and more expeditious than in the Argentine; and so far as convenience was concerned, all that it would be necessary to produce were the books of the plaintiff company.

Lord Justice Vaughan Williams said that, in his opinion, the appeal failed. He based his judgment on the proposition that there was not sufficient evidence that there would be any increased expense or inconvenience by reason of the trial taking place in England.

Lords Justices Buckley and Kennedy concurred, and the appeal was dismissed with costs.

BUSINESS NOTES.

Consular Notes.—France.—Writing on the subject of the electrochemical and electrometallurgical industries of his district, the British Consul at Lyons states that the year 1912 was unmarked by any noteworthy development or new departure in those industries which, however, continue to expand hand in hand with the ever-growing utilisation of water power, on which they depend. The manufacture of nitrides from bauxite, by the Seopeck process, has, contrary to expectation, not yet passed out of the experimental stage, and it is, indeed, no secret that the series of costly experiments which have been carried on for the last two or three years at the works of the controlling combination of aluminium companies close to St. Jean de Maurienne, in the Valley of the Arc (Mont Cenis road), have not been covered with the success that was anticipated, difficulties having been encountered in arriving at the high temperatures in the electric furnace necessary for the process. The Consul understands that a rival system requiring lower temperature has been invented, and will probably be exploited by another combination. The production of cyanamide—nitrates obtained from the atmosphere by means of the electric furnace—is being carried on at Notre Dame de Briancau (Isère), but on a very modest scale, very far below that of the great Swedish works at Alby. The output of the various branches of these industries in the district in 1912 is estimated as follows:—

	Tons.	£
Aluminium	9,000	594,000
Ferrosilicium...	30,000	204,000
Ferrochrome and ferromanganese ...	15,000	270,000
Calcium carbide	20,000	200,000
Carbide of silicium	1,500	54,000

An interesting development in the electrometallurgical industry is announced in the shape of the formation of a company for the production of zinc in the electric furnace by a process invented by two Frenchmen. A similar method of production is already being worked in Norway, but in France zinc ore has hitherto been treated to processes heated with coal, and owing to the heavy cost of the carriage of this fuel, of which at least three tons are required for every ton of ore, smelting has been confined to coal-bearing districts which, with the exception of Silesia, where the two minerals are found close together, are for the most part far from the deposits of zinc. The carriage of ore to the coalfields, though less costly than the transport of coal to the zinc mines, throws a heavy burden on the industry, and, moreover, necessitates the preliminary treatment of the crude ore at the mines by washing, in order that the percentage of metal contained in the ore to be transported may be as high as possible. As a result of these unfavourable conditions, the French zinc mines have hitherto been comparatively neglected, the cost of the carriage of the ore to the smelting works, even after the preliminary washing, being prohibitive at the present price of the metal; but the employment of water-power, which exists in abundance in close proximity to the zinc mines in the Pyrenees, will, it is believed, create an entirely new situation. Not only will the cost of the preliminary washing of the ore and its conveyance to distant smelting works be thus completely done away with, but it is claimed that production will be rendered more economical by the use of the electric furnace instead of coal, both in respect of the price of the actual power and the installation and upkeep of plant; while the cost of labour, which has hitherto been a factor of some importance, by reason of the special skill required to work the existing system of extraction, will be very considerably diminished owing to the simplicity of the electric process and the small number of hands needed to work it. Preliminary experiments having been successfully carried out by the syndicate controlling the patents of the new electric process in works at Arudy (Basses-Pyrénées) and Ugines (Haute-Savoie), the rights have been acquired by a company with a capital of £160,000, which has bought falls at Arrens (Hautes-Pyrénées), capable of generating 7,000 H.P., which will be conveyed to smelting works situated at Argelès within easy distance of all the principal zinc deposits in the district (Pierrefitte, Chèze, Arrens, Arre and Anglas), producing from 16,000 to 18,000 tons of ore yearly, which, it is calculated, could be doubled under more favourable conditions of transport, &c. The works at Argelès will, however, not be ready for two years, and the company, in order not to lose time, has meanwhile rented some existing works in Savoy having rights over water-power of 1,500 H.P., and conveniently situated for receiving ore for treatment. It is proposed to devote these works chiefly to the production of white zinc, for which there is a big demand in France, now that white lead is forbidden.

Sicily.—The Consul at Catania reports that the Societa Elettrica della Sicilia Orientale have practically completed their works and now produce about 9,000 H.P., partly disposed of.

Corea.—The Consul in Corea reports that there are at present 3,705 miles of telegraphic lines in that country, with 391 telegraph offices. There are also 2,172 miles of telephone lines outside of the cities, telephone subscribers numbering 8,290.

Japan.—A company, with the title the Japan Electric Furnace Industrial Co., has recently started a factory at Shimo Shibakawa, in the prefecture of Shiznoka, for the electrical production of phosphorus. The establishment is the first of the kind, and is being run on plans adopted as the result of suggestions made by the Industrial Investigation Bureau of the Japanese Department of Agriculture and Commerce, the work being carried out under the guidance of an expert from that Bureau.

Germany.—It is announced that the syndicate of German high-tension cable manufacturers have decided on the establishment of a joint sales office in Berlin.

The Erdmann Rogalski Magnet Zunderfabrik Gesellschaft is the name of a new company which has just been formed in Berlin, with a capital of £7,000, to introduce a new electromagnetic ignition system for motor-cars.

Catalogues and Lists.—Messrs. Musgrave & Co., Ltd., 35, Maddox Street, London, W.—Postal card illustrating their "Ulster" induced draught fans.

The Anglo-Engineering Co., Ltd., 35, Kirby Street, Hatton Garden, London, E.C.—Twenty-page catalogue, containing illustrations and abridged specification of their electric lifts, lift controllers, warehouse hoists, &c.

Mr. E. J. Hill, 26, Stanton Road, Wimbledon, London, S.W.—Circular relating to the advertising service that he is prepared to render. Mr. Hill was formerly advertising manager for the Foster Engineering Co., Ltd., and among other firms for whom he is now acting, are the British Electric Transformer Co., Ltd., Peebles and Co., Ltd. (gas engineers), Edinburgh, and Simms Motor Units, Ltd.

Messrs. Mavor & Coulson, Ltd., 47, King Street, Mile End, Glasgow.—No. 7 Yellow Book (112 pages), containing a reprint of the firm's data cards, issued during the last seven years, with reference to the performance of Pick-Quick coal-cutters in seams of different thicknesses. The machines included are mostly electrically driven.

The "Acme" Arc Lamp and Engineering Co., 77, Fortress Road, Kentish Town, London, N.W.—Twelve-page catalogue, giving illustrations, descriptive particulars and prices of the "Acme" arc lamps and metal-filament lamps; a second pamphlet gives similar information relating to the "Acme" flame arc lamp.

Messrs. Veritys Ltd., 31, King Street, Covent Garden, London, W.C.—Publication No. 754 is a 30-page pamphlet, entitled "Aston Portable Electricity." A full collection appear of different types of pocket electric lamps, small and large torches, police or service lamps, accumulator hand lanterns, miners' lamps, travelling and inspection lamps. Other contents include some electric novelties, also batteries and accumulators for the lamps referred to above. Prices are clearly shown in all cases.

The British Thomson-Houston Co., Ltd., 77, Upper Thames Street, London, E.C.—We have received a copy of the "Mazda House News," the new house journal of the B.T.H. Co., the purpose of which is to "give information on Mazda House matters and to stimulate electric lighting business." It contains in the course of its 20 pages a number of articles which the electrical contractor and tradesman will find of interest, including a list, with illustrations, of publicity literature which is available. Those who desire to receive the "News" regularly should communicate with the company's publicity department, as above.

Mr. George Wilkinson, Beech Mount, Harrogate.—Pamphlet containing illustration and particulars of the new "Losles" automatic electric water heater.

The Electrical Co., Ltd., 122-124, Charing Cross Road, London, W.C.—List of electric motors in stock on October 1st.

Messrs. Landis & Gyr, Ltd., 28, Denman Street, London, S.E.—Illustrated leaflet, describing their two-rate meter, with hand control and self-contained switch.

Bankruptcy Proceedings.—W. R. Wedge, Albion Place, lately carrying on business as an electrical engineer, at the Arcade, Northampton.—At the Northampton Bankruptcy Court on Monday, before the Registrar (Mr. T. M. Percival), bankrupt appeared for his first public examination. The statement of affairs showed liabilities expected to rank £167, assets estimated to produce £77, leaving a deficiency of £90. Debtor was closely questioned by the Official Receiver with regard to his book debts. Regarding debtor's first statement of affairs, the Official Receiver said it was obviously inaccurate, and he stopped debtor from swearing to it. He had a sleeping partner who had advanced £60, and his (debtor's) tools were worth about £35. There was a loss in carrying on the business of £145, for which he could not account. Adjourned until November 11th.

Herbert William Wilson, consulting engineer, West Derby, Lanc.—First meeting October 20th; public examination, November 3rd; both at Liverpool.

An Austrian Lamp Co.—According to a Vienna report to the *Financial News*, under the auspices of the Bank of Austrian Lands (Oesterreichische Länderbank), of Vienna, the formation of the Incandescent Lamp Co. Watt, in Vienna, has taken place, the initial capital being fixed at 2,000,000 kronen.

Theatre Lighting.—With reference to our recent paragraph on Osrams at the London Opera House, the contractors for the supply of Osram lamps in this instance were the British Economical Lamp Co., of 9, Old Bailey, E.C.

"Cantie" Switches.—An advertisement has been appearing in our pages in which Messrs. Marsh, Son & Co., Ltd., are offering "Cantie" switches for sale owing to their business being wound up. Our readers are, of course, aware that the reference to winding up does not apply to the "Cantie" Switch Co., Ltd., of Nottingham, who are the sole manufacturers of these switches, the word "Cantie" being their trade mark.

Liquidation.—Cheap Power Supply and Engineering Co., Ltd.—This company is winding-up voluntarily with Mr. W. T. Green, 33, Lloyd Street, Manchester, as liquidator. A meeting of creditors is called for October 22nd at 77, Fountain Street, Manchester.

Book Notices.—The October issue of the *Faraday House Journal* contains an article by Mr. F. T. Chapman on the Amsler Planimeter, biographical sketches of Mr. G. Scott Ram, Mr. Bernard Sankey, and Mr. G. H. E. Vivian, and an account of high-tension transmission of electrical energy by Mr. E. Fries-Smith. The Wolseley Tool and Motor-Car, Ltd., has been added to the list of firms associated with the Institution.

"Gas Works Directory and Statistics, 1913-1914." London: Hazell, Watson & Viney, Ltd. Price 10s. 6d. net.

"Science Abstracts." Sections A and B. Vol. XVI, Part 9. September 29th, 1913. London: E. and F. N. Spon, Ltd. Price 1s. 6d. net each.

"*Transactions* of the University of Toronto Engineering Society." September, 1913. Toronto: The Society.

"*Journal* of the United States Artillery." Vol. XL, No. 2. September-October, 1913. Fort Monroe, Va.: The Coast Artillery School Press.

"*Journal* of the American Society of Mechanical Engineers." Vol. XXXV, No. 10. October, 1913. New York: The Society. Price 35 c.

"Melting Points of the Refractory Elements," by G. K. Burgess and R. G. Waltenberg; "The Silver Voltameter," Part III, by E. B. Rosa, G. W. Vinal, and A. S. McDaniel. Washington: Government Printing Office.

"Annales des Postes, Télégraphes et Téléphones." September, 1913. Paris: A. Dumas. Price 10 fr.

"Recherches Experimentales sur le Coupage des Fers et Aciers par les Chalumeaux à Jet d'Oxygène." By R. Amédéo. Paris: Union de la Soudure Autogène. Price 3 fr.

"*Bulletin* Mensuel of the Société Belge d'Electriciens." Vol. XXX. September, 1913. Brussels: E. Bruylant. Price 1 fr. 75 c.

"*Bulletin* of the Association des Ingénieurs Electriciens." Vol. XIII, No. 7. July, 1913. Paris: Gauthier-Villars. Price 5 fr.

Trade Announcements.—The Midland Electric Manufacturing Co., Ltd., of Stafford Works, Rea Street South, Birmingham, announce that Messrs. S. T. Pemberton & Co. have now ceased to represent their interests in the Midland Counties, and pending fresh arrangements inquiries should be sent direct to the head office, as above.

The Electrical Supplies Co. have commenced business at 4, Cheapside, E.C., as wholesale dealers in electrical apparatus. They desire to receive catalogues from manufacturers, with factor's discounts, &c.

Mr. T. G. Poole announces that having severed his connection with Mr. Mabbs as from October 1st, he has taken premises at 16, John Dalton Street, Manchester, where he will trade as T. G. Poole & Co. as a wholesale electrical supplier, and will hold large stocks of switches, lamps, carbons, &c.

Messrs. Guest & Co., of the Great Cornbow Works, Halesowen, have added to their business an electrical engineering department, with Mr. G. H. N. Reay as engineer and manager.

Messrs. Haseltine, Lake & Co., chartered patent agents, ask that all communications for them should be addressed to 28, Southamptom Buildings, Chancery Lane, W.C. Though they have been in these offices for the last six months, letters are still incorrectly addressed.

Fire.—A fire has occurred in a sawmill at the premises of Messrs. S. Bill & Co., Ltd., manufacturers of electrical accessories, 146, Queen's Road, Aston, Birmingham. The roof was seriously damaged, and we understand that, in consequence, the department affected will be stopped for a week or two.

Swiss Imports of Electrical Machinery.—The value of the foreign electrical machinery imported into Switzerland last year amounted to £59,160, as compared with only £40,640 in 1911. How largely the trade is in German hands may be judged from the fact that Germany's share of the 1912 total was no less than £54,440.

Lamp Works in the Argentine.—The *Review of the River Plate* publishes the following:—"J. Reviriego, an Argentine citizen, has applied to Congress for a temporary privilege to establish a metallic-filament electric lamp factory. He asks for freedom of duties on the necessary machinery to the value of $50,000, and also on the raw material which is not to be found in the country. We strongly recommend representatives of incandescent lamp manufacturers to take the necessary steps to protect their patent rights and also their trade marks, if they have not already done so."

LIGHTING and POWER NOTES.

Accrington.—Public Lighting and Plant Extensions.—A Committee of the Corporation has decided to try the experiment of lighting Green Haworth district with electricity.

By invitation of Ald. E. Higham, chairman of the Electricity Committee, the members of the T.C. visited the electricity works last week. Ald. Higham gave a detailed explanation of the working of the gas plant, as compared with the steam plant, and said that as the whole plant was now fully occupied it was absolutely necessary to move at once to increase it. The Committee, he said, had

already instructed the borough engineer to get out plans and estimates for utilising the engine house to its full extent, and it was decided that the electrical engineer should prepare plans and estimates for the extension of the gas-making plant and engines, for the duplication of the present installation.

Argentine.—There is a movement on foot in Azul to form a co-operative electric light company. The contract for the public lighting held by the Cia. de Eléctricidad de la Provincia de Buenos Ayres shortly expires, and it is not yet known if it will be renewed. The Commissioner is consulting with the leading inhabitants on the subject.—*Review of the River Plate.*

Ayrshire.—Prov. Order.—The C.C. has received an intimation from the Ayr T.C. that it is promoting a prov. order for the supply of electricity in the districts of Prestwick and Alloway. The Law Committee has recommended the C.C. not to consent to the application.

Bangor.—The City Council has agreed to an increase of 2d. per unit in the price of electricity for lighting purposes. Alderman Bayne reported that improvements in electric lamps had led to a reduction of 20 per cent. in the consumption of energy, and the E.L. Committee considered it necessary to increase the price.

Bournemouth.—Loan Sanction.—The T.C. has received from the L.G.B. sanction to a loan of £1,600 for lighting by electricity the Undercliff Drive and the West Undercliff Parade. The work is to be put in hand with as little delay as possible.

Bradwell (Staffs.).—Hospital Lighting.—It has been decided to have the extensions to Bradwell Hospital, to be carried out at a cost of £7,500, lighted by electricity instead of by oil.

Bulkington.—Prov. Order.—The Midland Electric Light and Power Co., Ltd., is applying to the B. of T. for a prov. order in the area of the U.D.C. Powers for supplying the district are already possessed by the Leicestershire and Warwickshire Electric Power Co., Ltd.

Banbridge (Ulster).—Having failed to obtain a prov. order, the Council has decided to advertise for tenders for a three years' contract for lighting the public streets by gas or electricity. In case the tender accepted is for lighting by electricity, the contractor is to have the right to supply current for private consumption.

Burnham (Somerset).—A special meeting of the U.D.C. was held to meet Dr. J. A Purvis, who is responsible for the electric light scheme. Dr. Purvis withdrew by letter a communication to the effect that unless the capital required were reduced by about £1,000, by using overhead wires instead of underground mains, the company could not be floated. A second communication stated that the shares required had been taken, the company would be floated, and the original scheme of underground mains would stand. The scheme would therefore go on as before, the Council having expressed its agreement.

Carnarvon.—In reply to correspondence between the T.C. and the National Electric Construction Co., the latter states that it has up to date lost £7,000 on the working of the undertaking. Early last month the company circularised its customers to the effect that the price of current for lighting would be increased from 5d. to 6d. per unit after the 25th ult. The Electricity Committee of the Corporation then instructed the town clerk to write to the company reminding it of a statement that it would not be likely to increase the price beyond 5d. per unit. In reply, the company's manager stated that had the conditions remained the same as they were in 1904, the price would not have been raised. The company had lost up to date £7,000 after paying the sinking fund and interest instalments. It was as much in the interests of the Corporation as of the company that every attempt should be made to put the undertaking into a position to earn a profit to cover at least the capital charges. The Council at its meeting received a recommendation from the Electricity Committee that the company be informed that the increase in the price was against the best interests of the undertaking, which contention derived support from the managing director's statement in 1904, that if the undertaking would not pay with electricity at 5d. per unit, it certainly would not pay at 6d. A proposal was made that a committee be appointed to inquire into the relations of the Corporation and the company, but this was defeated, and the Committee's report was adopted.

Connah's Quay.—The U.D.C. has accepted an offer made by Mr. Leigh to inspect the district and report upon a scheme for electric light for the town at a fee of three guineas.

Crowle.—Public Lighting.—The U.D.C. has decided to ascertain from small towns where electricity is used for public lighting, particulars of the cost, &c. This is in response to an offer from a firm at Bradford to advise the Council on the question.

Dover.—The Electricity Committee of the T.C., on October 7th, received a communication from the South-Eastern Electric Power Co., stating that it was considering the question of supplying the neighbouring towns, works, &c., with electricity in bulk, and would be glad to include Dover in the scheme. It expressed the opinion that it would be able to supply current at such a price as would obviate any deficiency in running the undertaking, and also to the advantage of consumers. It was stated that the company had got a small plant for its own use at Tilmanstone, near Dover. The chairman said that the engineer had better find out when the company would be able to give the suggested supply. The engineer said they would have to make considerable alterations before they could take three-phase current at 50 periods. The company would bring current to the town at 11,000 volts, and the Council would have to transform it to 2,000 volts. It would mean an expenditure at the works of £4,500, and he should like to have independent advice. The Committee deferred further consideration of the question, so that the engineer could get fuller particulars from the company.

Durham.—A Colliery Power Scheme.—It may be remembered that in 1907 the Durham Collieries Electric Power Co. arranged with the Newcastle-upon-Tyne Electric Supply Co. and the associated companies to operate and maintain the Philadelphia power station, increasing the capacity from 6,000 KW. to 10,000 KW. The Philadelphia station has now been purchased by the Lambton and Hetton Collieries, Ltd., and the colliery company is removing five of the turbines and installing three A.E.G. machines, each of 6,000 KW. capacity, at 75 power-factor, running at 2,400 R.P.M. It is anticipated that the thermal efficiency of the station, when operating these new sets, will be at least as favourable as at any other station operating under similar conditions, the steam consumption figures guaranteed being exceptionally low. An interesting feature of this scheme is that an arrangement has been entered into with the Newcastle-upon-Tyne Electric Supply Co., whereby it is to supply the labour for the operation of the station and also to provide a stand-by supply to the colliery company from the network of cables at Philadelphia. Hitherto, the Lambton and Hetton Collieries, Ltd., have purchased the power for their important group of collieries from the Durham Collieries Electric Power Co., and in order to ensure greater reliability the stand-by required at the station is to be provided from the network of the Newcastle-upon-Tyne Electric Supply Co. and its associated companies, instead of putting down additional spare plant at the Philadelphia station. The boiler plant is to be completely re-arranged and enlarged, but the contracts for this work have not yet been placed. The new arrangement will come into force in January, 1915.

Eastbourne.—The T.C. has decided to purchase a steam coal wagon, at a cost of £550, for the use of the electricity department.

The Guardians have decided to install electric light in the infirmary.

Eastleigh.—Proposed Electricity Supply.—The Electricity Sub-Committee of the Southampton T.C. has informed the U.D.C. that it will be willing, on obtaining a prov. order, to include Eastleigh and Bishopstoke in the area of supply, and that subject to the maximum supply prices clause, &c., the price of current would be a flat-rate of 4d. per unit for private and shop lighting; for power, 10 per cent. above the existing rates at Southampton; and for heating and cooking 1d. per unit, and provided that the public lighting was converted to electricity in all the streets along which the mains would be laid, the charge for public lighting would remain as at present.

Falkirk.—The Callander Coal Co. is equipping the new colliery at Slamannan with up-to-date electrical machinery for coal-cutting and pumping.

Glasgow.—Bailie Smith and Mr. Lackie, the city electrical engineer, have returned from their tour in Canada and the States, and will report to the Corporation in due course. It is said that both gentlemen were impressed with the much greater use that is made of electricity on the other side of the Atlantic.

Gelligaer.—Prov. Order.—The District Council has decided to apply for a prov. order for lighting the wards of Bedlinog and Fochriw with electricity.

Harwich.—The T.C. has raised a loan of £3,370 for the electrification of the pumping station.

Hebburn-on-Tyne. — The Cable Question.—At a meeting of the U.D.C., on the 13st inst., the General Purposes Committee reported that the clerk had again written to the Northern Counties Electricity Supply Co., Ltd., in regard to the condition of the cables in the district and the further fusings that had taken place, and had received a reply setting out the advantages that would be derived from the change-over to the A.C. system, and stating that when the change-over had been made, the supply in the district would be much improved, and that the unfortunate occurrences complained of would cease. A letter had also been received from the B. of T., to the effect that the Board proposed to hold a general inquiry as soon as possible, in regard to the particular method of laying cables in Hebburn and certain other districts, and that experiments were being made on samples of bitumen used in these districts. The Council decided to employ an expert to inspect the mains, and to report to the Council, and, if necessary, to attend the inquiry in London.

Herstmonceux (Sussex).—Electric Cooking *ad lib.*—A supply of electricity for cooking at this village has been provided by Mr. C. W. Von Roemer, who undertakes to fit an electric stove in any house in the parish free, and to supply current at 1½d. per unit. The offer has been liberally accepted.

Holmfirth.—Proposed Loan.—The U.D.C. has decided to apply to the L.G.B. for sanction to borrow £8,000, for the purpose of generating and distributing electricity.

Hull.—Prov. Order.—The City Council sanctioned on the 9th inst. an application to the L.G.B. for a prov. order to supply electricity to the village of Sutton.

Knaresborough.—Hydro-Electric Scheme.—The U.D.C. has had under consideration the question of erecting plant for the supply of electricity to the old town, and at the last meeting of the Council approval was given to a scheme which proposed to utilise the waters of the Nidd. The Council owns a mill and dam at the foot of Castle Hill, and it is suggested that the necessary outlay should be made on these premises, and the machinery installed.

Leeds.—The Roundhay E.L. Purchase.—At the last meeting of the City Council consideration was given to a recommendation of the Finance Committee that the Corporation should purchase the Roundhay and District Electric Lighting Co. for £17,000, but, after some discussion, it was resolved to refer the matter back to Committee. The reason for this decision was that several members of the Council objected to the large amount of money it was proposed to pay for a concern which, it was stated, had only commenced paying dividends four or five years ago, and since then had only averaged 1 per cent. The price proposed to be paid worked out at £137 per £100 value of the company's stock, and it was stated that the lamps would have to be replaced, and that the great bulk of the mains were useless.

Lincoln.—L.G.B. Inquiry.—An inquiry was held on October 9th into the application of the T.C. for a loan of £10,850 for a refuse destructor. There was no opposition.

Liverpool.—A preliminary report on electric supply in the city, states that there are about 9,700 consumers connected to the supply mains, compared with 8,938 a year ago, and the supply during the current year shows an increase of over 12 per cent. on the quantity supplied during the corresponding period of last year, being an increased output of 3,000,000 units for the eight months, as against 2,200,000 units for the previous 12 months. During this year the demand for electrical energy for power purposes has been most satisfactory, as applications have been received for the supply to over 3,500 H.P., and in several cases an alternating-current three-phase supply is to be given through a sub-station provided on the consumer's premises. The increased revenue for the six months ending June over the corresponding period of last year was about £10,000. Out of the profits of the business, the sum of £707,330 has been set aside towards repayment of capital, and £300,000 to reserve against depreciation and other contingencies. In addition to this, £235,000 has been allotted to the relief of rates, the contribution to this object for the current year being over £30,000.

To assist small power users to adopt electrical energy, motors are supplied on the hire-purchase system, and to encourage the use of electrical energy for domestic and other purposes, suitable apparatus for heating and cooking is supplied on the same system.

The electric lighting of the Liverpool Exhibition has been carried out by the department, and the exhibit in conjunction with the electrical contractors of the City, is expected to produce beneficial results, as the demonstrations given in connection with cooking and heating have created great interest in the use of electricity for these purposes.

The reconstruction of the Lister Drive No. 1 power station is making satisfactory progress, and it is hoped to have the water-tube boilers, which are to replace the Lancashire boilers, under steam in the early days of next month. There are also on order two 6,000-KW. turbo-alternator sets which are not due for delivery until the middle of next year. The reconstruction of the Pumpfields power station is now in hand, and three rotary converters are expected to be in service before the close of the year.

Llandudno.—The Pier Co. has decided to proceed with a scheme for the combined heating and ventilation of the Pier Pavilion by electricity.

Loftus.—Public Lighting.—The U.D.C. has decided, subject to an approved agreement, to take a supply of electricity for public lighting from Messrs. Pease and Partners.

London.—Hammersmith.—The E.L. Committee reports having had under consideration the advisability of organising an electrical exhibition in connection with the Council's undertaking, but upon going into details, it thinks that it is extremely doubtful whether the trading returns of an exhibition would be satisfactory unless a much larger sum was expended than the £300 proposed. Under these circumstances the Committee does not propose at present to submit any proposal for organising an exhibition.

Stepney.—Application is being made to the L.C.C. for the advance on loan of £15,000 on account of extensions at the Limehouse generating station.

Loughborough.—L.G.B. Inquiry.—Mr. H. R. Hooper held an inquiry last week into the application of the T.C. for sanction to borrow £14,000 for the extension of generating plant. Mr. Hooper first criticised the method of keeping the accounts, which he contended were misleading and not in conformity with the L.G.B. requirements. The engineer explained that it was intended to install a Ljungström turbine and alternator for H.T. supply, and a rotary converter to link up the new plant with the old, and some discussion ensued with the Inspector as to the advisablity of installing a comparatively new type of turbine in a place like Loughborough, when other well-tried designs were available. It was pointed out that two of these turbines (the construction of which was described in the Elec. Rev. last week) are on order for the Luton Corporation. The Inspector further pointed out that the Council had not followed the recommendation to appoint separate committees for gas and electricity.

Malta.—It is probable that the electric lighting scheme will be extended to the suburban villages of Valetta. Some time ago the Government proposed to extend the electric lighting to most parts of the island, but this scheme was abandoned on the question of cost. The superintendent of the electric lighting department, in his annual report, says after allowing for interest on capital and rent of the central station, the net profit for the year amounted to £6,426, or 8·12 per cent.

Manchester.—A new G.E.C. 100-H.P. three-phase electric motor has recently been installed at the works of Crossley Motors, at Gorton, Manchester; the machine runs at a speed of 750 R.P.M., and transmits its power to the line shafting through nine ropes. A transformer station with switchgear has also been installed, the necessary current being taken from the Corporation supply mains at 400 volts.

New Zealand.—Messrs. J. J. Craig, Ltd., Auckland, are claiming £148,746 from the City Council as compensation for land taken for, and injuriously affected by, the city electric power station.—*British Australasian.*

Norwich.—L.G.B. Inquiry.—On Tuesday, Mr. T. C. Ekin held an inquiry into an application by the T.C. to borrow £25,000 for the purposes of its electricity undertaking. Since the T.C. acquired the undertaking a profit of £51,919 had been realised; of this amount £37,855 had been applied to depreciation. The inspector said the statement was interesting; the only black spot appeared to be a contribution of £1,200 of the profits in reduction of rates in 1909.

Perth.—Opening a three days' exhibition of electrical cooking, heating, and other appliances, Lord Provost Scott remarked that they owed the exhibition very largely to the energy and enthusiasm of Mr. M'Cracken, convener of the Electricity Committee, backed up by the manager. Speaking of the small cost of the articles on view his Lordship reminded the audience of the offer made by the Corporation by way of concessions to those already using electricity for illuminating purposes; it would be a very easy matter to attach the wiring for the purposes of cooking, &c.

Ramsbottom.—Experimental Lighting.—In Bolton Road West six lamps lighted by gas and six lighted by electricity, have been placed in position for experimental purposes.

Redcar.—Prov. Order.—The B. of T. has asked the U.D.C. for its observations regarding the proposed revocation of the E.L. order granted 13 years ago, and later purchased from the Council by the Cleveland and Durham E.P. Co. The Council has replied that it does not wish the Order to be revoked if the company will give an assurance to take action under it within the next two years.

Rushden (Northants).—A Sub-Committee which has had under consideration the question of motive power for the ejector plant has reported, after obtaining estimates, that the cost of installing the various plant would be as follows:—Oil, £78; electric, £72; gas, £45. Having regard to the intermittent use the plant will be put to, the Sub-Committee recommended the adoption of electric power as the most convenient and suitable for the purpose. The cost of current will exceed the cost of gas, but the saving of expense in attendance will more than compensate for this. The U.D.C. has confirmed the recommendation and accepted the tender of the Rushden and District Electric Supply Co., Ltd., for the work.

Sheffield.—Colliery Power Plant.—At their Waleswood Collieries, near Sheffield, Messrs. Skinner & Holford, Ltd., are extending their electrical plant, consisting of two 250-KW. B.T.H. mixed-pressure turbo-generators, by the installation of a 750-KW. mixed-pressure turbo-generator of the same type, whilst a central condensing plant of the barometric jet type, capable of dealing with the exhaust steam from these turbines, is being provided by Messrs. Mirrlees. The turbines will be operated by exhaust steam from the winding engine, compressors, fan engine, &c., and the whole installation when completed will represent a plant of considerable size. It is anticipated that the cost of production of current will not exceed ·15d. per unit after providing for interest and depreciation. The electrical output obtained from this generating plant will be utilised for operating two main rope haulage gears which have recently been installed, each of 350 effective H.P., and for driving the motors in connection with the new Simon-Carves coke-oven plant which has recently been erected at the Waleswood Collieries. The scheme is being carried out under the supervision of Mr. W. C. Mountain, as consulting engineer.

Slaithwaite.—Prov. Order.—Consideration is being given by the U.D.C. to the matter of applying for a prov. order authorising the Council to generate and supply electricity.

Somerby.—The Melton Mowbray R.D.C. has given the local E.L. Co. permission to use overhead lines in the village of Somerby.

South Africa.—In connection with the Wellington (Cape Province) electric light installation which is now in process of erection, the municipality has adopted the system of municipal wiring. Tenders were called for the work, and the contract has

been given at the rate of 19s. per point for slip-joint conduit on the surface, with additions at schedule rates for screwed conduit, concealed work, &c. The lowest tender was 18s. per point.

St. Anne's-on-Sea.—The E.L. Committee has decided that the Lytham Council be informed that the question of a bulk supply of electricity is so involved that only by a personal interview is there any likelihood of a mutual arrangement.

Stretford.—Loan Sanction.—Sanction has been received to the borrowing of £5,000 for distributors and services, and £2,000 for motors.

Sturry (Kent).—Proposed Water Power Scheme.—A public meeting was held on October 8th to discuss the proposed electric light scheme for Sturry, Fordwich, Westbere and Broad Oak. Mr. Colin Campbell, promoter of the scheme, stated that it was proposed to utilise the water-power at a local flour mill, which was at present running to waste. It was decided to have details of the scheme circulated with a view to a local company being formed.

Sunderland. — Electric Pumping Plant.—Messrs. S. P. Austin & Son, Ltd, have decided to remove the existing gas-driven centrifugal pumps at their Wear Dockyard, and replace them by an electrically-driven plant. It is proposed to install two Gwynne centrifugal pumps, running at 410 R.P.M., driven by Westinghouse three-phase slip-ring motors, and these will be capable of pumping from the dock about 7,000 tons of water in 14 hours. The current will be taken from the mains of the Corporation. The work will be carried out under the direction of Mr. W. C. Mountain, consulting engineer.

Towyn and Aberdovey.—The U.D.C. has under consideration a report by a sub-Committee appointed to meet Mr. Haydn Jones, M.P., and arrange terms for an electric lighting scheme for the district.

Tynemouth.—Proposed Loan.—Application is to be made to the L.G.B. for sanction to borrow £3,000 for mains and £500 for services required during the next three years.

Wakefield.—Street Lighting.—The Lighting Committee has decided to light Barnsley Road, from Milnthorpe Green to Newmillerdam, by electricity.

Warrenpoint.—Proposed E.L.—The Urban Council has decided to consult a firm of electrical engineers with a view to having the town lighted by electricity.

Watford.—At the last meeting of the R.D.C. a letter was read from the Aldenham P.C., asking the R.D.C. to urge the Watford U.D.C. to include Aldenham in the area of the proposed prov. order. The consideration of the matter was deferred until the next meeting.

Weston-super-Mare.—Street Lighting.—The U.D.C. proposes to have the Boulevard and Waterloo Street lit by electricity in place of gas, and has asked the E.L. Co. to quote terms for the supply of current.

Whitehaven.—The T.C. has offered to renew for another 10 years, on the same terms as at present, the contract with the B. of G. for the supply of current to the workhouse.

Windsor.—Public Lighting.—The T.C. has accepted the tender of the Windsor Electrical Installation Co., Ltd., to supply 31 three-light metal-filament lamps for public lighting at £14 each per annum for five years at the expiration of the existing contract, which is at £18 per lamp.

Wolverhampton. — L.G.B. Inquiry. — Mr. H. R. Hooper held an inquiry last week respecting an application by the T.C. for sanction to borrow £22,000 for the purposes of the electricity undertaking. The Town Clerk explained that the present application was for the purpose of increasing the equipment of the works, and that £15,000 was for mains extensions, £5,000 for sub-station equipment, and £2,000 for E.H.T. switchgear. It was possible that very shortly another inquiry might have to be held in respect of a further sum of £30,500 for buildings, steam generating plant and other work. Of late several feeders in the town had been considerably overloaded, and the greatest difficulty was experienced in keeping up the voltage in those neighbourhoods. The Council were very anxious to push on with the work affected by the present inquiry, and equally anxious about the other scheme mentioned. The Inspector examined the details supplied, and the inquiry terminated without opposition. The £35,000 scheme includes one 4,000-KW. turbo-alternator, two water-tube boilers, one 1,000-KW. rotary converter, switchgear, &c. In the course of an exhaustive report presenting this scheme to the Corporation, Mr. S. T. Allen, the borough electrical engineer, remarks that the rapidly increasing demand for electricity supply for all purposes is gradually loading up the present generating plant at the Commercial Road Works, and it is very necessary that preparations be made at once to cope with the extra load which it is estimated will be experienced in the winter after next. The total capacity of the generating plant, including all that at the destructor works, and also that part of the old plant at Commercial Road, which is fast becoming obsolete, is 8,200 KW. The estimated maximum load to be provided for next winter is 6,260 KW., which will allow 1,940 KW. of spare plant. It is estimated that during the following winter the maximum load will be at least 7,260 KW., leaving only 940 KW. of spare plant, which would be totally inadequate. On account of the time taken by manufacturers to make and deliver such generating plant as would be required, it is very essential that tenders be invited and orders placed as soon as possible.

In July an Electrical Exhibition was held at the time of the Floral Fête, and advantage was taken of the opportunity to introduce the new domestic tariff for heating and cooking purposes:—15 per cent. of the rateable value and ½d. per unit for all electricity consumed. In addition, a series of lectures and demonstrations in electricity cooking was held daily during the first two weeks in September. We understand from Mr. Allen that the result of these two exhibitions, together with the introduction of the new system of charging, has been to flood the department with a tremendous number of orders, which demonstrates to a marked degree the success of the efforts in popularising electricity for this purpose, and proves again the value of advertising, as without doubt the money expended has been well laid out. The applications for connection for power purposes keep the department very busy, and one of the largest increases in the H.P. connected during any quarter will be recorded for both the June and September quarters. It is interesting to note that in Wolverhampton the number of units sold per head of population is now one of the highest in the kingdom.

Worcester.—At a meeting of the City Council, on Tuesday, the E.L. Committee recommended that certain changes should be made at the Powick station by which they hoped to increase the amount of current generated by water power. Ald. Parker said their output was increasing to a large extent, and at present the water power was useless to cope with it. The chairman of the Committee said the undertaking now had to pay 14s. 2d. per ton for coal, but in 1905 it was 9s. a ton. As they were giving orders for 5,000 tons it was a serious matter. Ald. Walter Caldicott said he now thought they should dredge the river at that point. The value of the work would be worth the expense. He regarded the water power as the saving clause in the electricity undertaking.

Worksop.—Workhouse Lighting.—The Guardians have decided to substitute electricity for gas in the illumination of the workhouse. Mr. Hartland said that while 86 gas lights in the workhouse cost £32 per year, 221 electric lights in the new infirmary only cost £47.

TRAMWAY and RAILWAY NOTES.

Australia.—It is stated in the Press that the Bill authorising the construction of an underground railway and tramways in Sydney, at an estimated cost of £4,800,000, has been thrown out.

Bournemouth.—Tramway Loan.—The T.C. has applied to the B. of T. for a loan of £7,556 for the construction of a double line of tramway between the cemetery and Winton.

Bradford.—The Markets Committee is urging the tramways department to continue and improve the North Park Road service in lieu of withdrawing same. At the last meeting of the T.C., the clerk reported with reference to the terms of the draft lease of the Bingley tramway, that the B. of T. had signified its willingness to endorse its consent on the lease. Tenders are invited for a supply of the chassis required for 28 trolley vehicles. With regard to the purchase of special motors for use on cars between Bradford and Leeds, the Council has decided to obtain 20 Dick, Kerr Standard 40-H.P. motors at £104 each.

Continental Notes.—France.—The Conseil Général of the Department de la Manche, at its last meeting, considered the question of the construction of the second network of local railways, the working of which by electricity has been advocated by the engineer-in-chief in his report. The Commission des Chemins de Fer, after hearing the report, adopted in principle the electrification of the projected network, subject, however, to a detailed and favourable report as to the existence of available waterfalls in the Department. This question is, therefore, to be considered at the next session of the Conseil Général.—*Revue Pratique de l'Electricité.*

A new section of the Metropolitan Electric Railway in Paris—that between Beaugrenelle and Auteuil—has just been completed, bringing up the total length of the lines in operation to 48¾ miles.

Russia.—The Russian State Railway authorities are reported to be preparing plans in respect of a projected electric railway between Moscow and Wosnessensk.

The tramway employés who have been on strike in Moscow returned to work on the 9th inst., and traffic over the system was resumed.

Edinburgh.—The Tramways Committee, after considering a report by the burgh engineer, recommends the Council to extend the tramways to Corstorphine at a cost of £12,500, and to proceed with the scheme for extending the tramways to the Redford and Dreghorn districts.

Greenock.—The Corporation is to obtain a report from its Parliamentary agent on the question of the Greenock and Port Glasgow Tramway Co.'s accounts in relation to the proposal to municipalise the undertaking.

Leicester.—The T.C. has applied to the L.G.B. for a loan of £5,700 for the provision of six new tramcars.

Liverpool.—The Tramways Committee on the 10th inst. agreed to advance the wages of the whole of the outdoor staff, including inspectors, motormen, conductors and shed assistants. The men to receive increases will number 1,800, and the extra cost will exceed £6,000 a year. In a report presented by the Committee, it was stated that the increased revenue for the six months ending June, over the corresponding period of last year was about £10,000.

Manchester.—Mr. J. M. McElroy, general manager, presented a report to the Tramways Committee on Tuesday, showing the results of the last half-year's working. During the period from April to September the mileage run was 9,769,574, an increase of 324,047. The passengers numbered 102,144,962, an increase of 9,926,230. The energy used was 14,673,871 units, compared with 15,400,798 for the corresponding period last year, and the units per car-mile were 1·502, as compared with 1·630. The revenue per car-mile was 11·561d., as compared with 11·369d., and the working expenses per car-mile were 7·036d., as against 7·002d. The total income was £470,754, compared with £447,605, an increase of £23,149; the total working expenses were £286,477, as compared with £275,661, an increase of £10,816; the gross profit was £184,277, as compared with £171,944, an increase of £12,333; the charges for interest, sinking fund, renewals, &c., were £115,176, compared with £112,430, an increase of £2,746; and the net profit was £69,101, as compared with £59,514, an increase of £9,587.

The Tramways Committee intends to seek powers to run omnibuses along roads outside the city where tramways are either owned or leased by the Corporation, or over which the Corporation has running powers.

Newcastle-on-Tyne. — New Tramways. — The City Council will consider at an early date the question of promoting a Bill to acquire powers to extend its tramway system to Forest Hall station, in the Longbenton Council area.

Oldham. — The tramway receipts to date show an increase of over £4,000, as compared with the corresponding period of last year.

Preston.—New Tramways.—The Tramways Committee decided on the 8th inst. to promote a Bill authorising considerable extensions to the tramway system.

Prestwich.—At a special meeting of the District Council a resolution was ratified that the clerk give notice to the Salford Corporation that for the future, the arrangement under which the Council accepts £200 a year in lieu of its share of tramway profits be discontinued, and that the Corporation furnish the Council with a statement of accounts provided for by the lease.

Ramsbottom.—It is stated that the railless trolley vehicles are giving a steady and very satisfactory financial return—one which should ensure that there will be no burden on the rates in consequence of the step taken by the Council.

Southport.—The question of running cars on the railless trolley system is to be investigated, and a sub-committee is to visit Leeds to see the system in operation, and to interview Mr. Hamilton, the tramway manager.

Trafford Park (near Manchester).—At the annual meeting of Trafford Park Estates, Ltd., last week, the chairman referred to the development of the estates, and said the immediate need was tramway connection with Stretford, Urmston, Davyhulme and Patricroft.

York.—At a meeting of the City Council on the 13th inst., a report was submitted by the Tramways Committee that extensions be made to the Hull Road, Heworth and Huntington routes; that the Acomb route be extended to the centre of the village, and that power for all the extensions be obtained by way of a Light Railways Order or private Bill. The Hull Road extension was estimated to cost £18,611; the Heworth route, *viâ* Layerthorpe (trolley 'buses), £2,112; Huntington Road ('buses), £2,272; Acomb extension, £6,560; Hoxley Road extension, £3,192. A service of trolley-'buses from the railway station was also suggested, the estimated cost being £2,900. The proposals were agreed to. It was also decided to purchase premises in Friargate for offices and showrooms, the cost of the building being £4,000.

TELEGRAPH and TELEPHONE NOTES.

Fishguard.—A wireless telegraph station has been erected at Fishguard Harbour, as the outcome of an arrangement under which the Great Western Railway Co. have constructed the building and the G.P.O. has equipped it and will undertake its working. The installation is on the Marconi system, with a radius of 500 miles, the necessary power being obtained from the Great Western Railway generating station at the Harbour. Three of the company's Irish service steamers have also been equipped.

Wireless Commission.—The Scientific Wireless Telegraphy International Commission assembled at Brussels on Wednesday. The British delegate, Mr. Duddell, was elected president. The International Bureau fixed the next meeting for the beginning of next year.

New Cable.—The French Government has lately commenced the laying of a new submarine telegraph cable between Marseilles and Algiers, a distance of about 400 nautical miles. The cable will be laid at a maximum depth of 2,624 yd. between Marseilles and the Balearic Islands and 3,171 between the latter point and Algiers.

Marconi Wireless Rescue.—On Saturday morning the news arrived—by wireless, from the ss. *Carmania, via* Fishguard—that the ss. *Volturno*, from Rotterdam to Halifax, carrying emigrants, caught fire on the 9th in mid-Atlantic, and being in desperate straits called for help by wireless. The *Carmania* was the nearest to the scene, and putting on full speed arrived on the spot in four hours. During the day nine other vessels arrived and stood by, but owing to the heavy seas it was impossible to take off the passengers and crew until daybreak on Friday. Over 500 lives were saved. The Marconi operators on the *Volturno* remained on duty until the aerial was destroyed. Without the aid of the Marconi wireless installations, in all probability the whole of the passengers and crew would have been lost. Mr. P. B. Maltby, the operator on the *Carmania*, was on duty almost continuously for three days. By exceptional good fortune, the *Carmania* was able to communicate with Fishguard for some hours at a distance of 1,120 miles.

The Committee of the Seamen's Union is about to consult the members as to whether they are prepared to refuse to sail on any ocean-going cargo vessel not fitted with wireless apparatus, on and after May 1st, 1914.

Japan.—The Japanese Government has decided to install 3,000 telephones in Tokio during the current fiscal year.

U.S.A.—Up to July 1st nearly 1,300 amateur wireless operators had been granted licences by the Bureau of Navigation.

Spain.—The Spanish military authorities have just completed a wireless telegraph installation at Melilla, on the Telefunken system.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Sydney (New South Wales).—November 26th. An electrically-driven storage battery industrial truck (2,000 lb.) for the Randwick workshops of the Government Railways and Tramways Department. Local representation. Specification, &c., from the office of the Electrical Engineer to the Department, 61, Hunter Street, Sydney. A copy may be seen at the Board of Trade C.I. Dept. in London.

March 18th, 1914.—For the P.M.G. Seven automatic switchboards. Schedule No. 179. See "Official Notices" to-day.

Victoria.—November 12th. For the Victorian Railways; flame arc lamps.

November 12th.—Victoria Railway Department. State coal mines, Wonthaggi. The time for tenders for haulage engine and electrical equipment has been extended to November 12th, and a copy of the specification may be seen in London (C.I. Department, Board of Trade).

November 15th.—Melbourne Suburban Railways. Overhead electrical equipment of permanent way and overhead transmission mains. See "Official Notices" September 12th.

Victorian Railways.—November 12th. 17 miles lead-covered impregnated paper-insulated copper cable for track-locking roads. November 19th.—10 tons sulphate of copper for electrical purposes. Specifications may be seen at Board of Trade C.I. Dept. in London. November 12th.—One 60-H.P. electric motor and accessories.—*Australian Mining Standard.*

December 14th.—Two sections switchboard, common-battery multiple. See "Official Notices" to-day.

South Australia.—Adelaide.—November 12th. Postmaster-General's Department. Lamp-signalling trunk line switchboard. See "Official Notices" September 26th.

Launceston (Tas.).—November 24th. Two 500-K.V.A. transformers; feeder cable, &c.; H.T. switchboard for sub-station. Specifications from City Electrical Engineer (£1 1s.). (Time extended from October 13th).—*Tenders.*

Hobart (Tas.).—December 1st. Dry cells for the P.M.G. See "Official Notices" to-day.

Belgium.—October 22nd. The municipal authorities of Liége (Annexe de l'Hotel de Ville-Bureau des Adjudications) are inviting tenders for four transformer boxes. Particulars may be obtained from the Service de l'Electricité, 42, Rue Lambert-le-Begue, Liége.

Bradford.—October 18th. Corporation Tramways Department. Miscellaneous electrical and other stores for year ending December 31st, 1914. Tenders to Town Clerk.

Brymbo (near Wrexham).—October 20th. Parish Council. Incandescent electric lighting of the streets. Overhead system. 40 lamps. See "Official Notices" October 10th.

Bulgaria.—November 17th. Machinery required for a central electric generating station at the "Pernik" State coal mine. The estimated value of the contract is 200,000 fr. (£8,000), and includes three water-tube boilers, two double-expansion horizontal engines of 250 H.P. each, two three-phase dynamos, switchboards, transformers, &c., and a centrifugal pump of 500 litres per minute capacity driven by electric motor. Deposit £400; local representation. Some documents relating to the matter may be seen at the Board of Trade C.I. Dept. in London,

Canada.—October 25th. Regina, Sask., City Commissioners. One 3,000-KW. steam turbine with condenser; one 25-ton hand power crane. Specification from Mr. E. W. Bull, Superintendent of Light and Power Department, Regina. Deposit: 5 per cent. of tender.

Cardiff.—October 17th. Corporation. Passenger tickets and ticket punches for trams. See "Official Notices" October 3rd.

China.—SHANGHAI.—October 17th. Extra-H.T. pilot cable, &c., for the Council. See "Official Notices" October 3rd.

Dublin.—November 1st. G.N. Railway Co. (Ireland). One year's supply of stores, including a number of electric and telegraph supplies. See "Official Notices" October 10th.

Dumfries.—The Dumfries County Council invites tenders for electric lighting, telephones, electric clocks, and other electrical works and heating installation at the new County Buildings. Mr. W. Arnot, Electrical Engineer, 163, Hope Street, Glasgow.

Eastry (Kent).—Lighting the hospital for the B. of G. T. Steed Bayly, High Street, Deal.

Glamorgan.—The County Council desires to negotiate for the construction and working of five miles of light railway from Ynysforgan to Pontardawe. See "Official Notices" October 10th.

London.—BERMONDSEY.—October 23rd. Water softener and purifying plant at the Infirmary, Lower Road, Rotherhithe, S.E. Mr. E. Pitts Fenton, Clerk.

Manchester.—October 21st. Tramways Committee:—(*a*) Permanent way special track work; (*b*) permanent way points, tongues and hardened steel centres; (*c*) granite setts. Mr. J. M. McElroy, general manager.

October 29th.—One storage battery, battery booster and switchboard, for the Corporation. See "Official Notices" to-day.

Motherwell.—October 23rd. Electric lighting works in connection with extensions to the County Hospital. Deposit of £1 (returnable). Mr. W. E. Whyte, District Clerk, District Offices, Hamilton.

New Zealand.—DUNEDIN CITY COUNCIL.—Nov. 12th. Supply meters, maximum demand indicators and insulated cable and bare wire, for a period of two years. Specifications from the electrical engineer.—*New Zealand Shipping and Commerce.*

According to an advertisement in an engineering contemporary, the Auckland Harbour Board want tenders for slipway electric hauling machinery for hauling a vessel of 600 tons dead weight. Messrs. W. & A. McArthur, Ltd., of 18 and 19, Silk Street, London, E.C., are agents for the Board.

Rathmines and Rathgar.—November 4th. The Council. One 400-KW. generating set (high-speed engine direct coupled to two D.C. dynamos in tandem). See "Official Notices" to-day.

Rhyl.—November 19th. One 160-KW. Diesel engine set, for U.D.C. See "Official Notices" to-day.

Spain.—November 18th. The Harbour Works authorities at Valencia are inviting tenders for an installation of electric lighting at the port.

VALENZA.—December 29th. Tenders are invited for the installation of electric cranes and the electric light at the port of Valenza. Provisional deposit, 2,000 pesetas. Particulars, Dunta de Obras Publicas del Porto, Valenza.

Thakeham (Sussex).—Private telephone installation between the workhouse and Storrington (about one mile), for the B. of G. Percy Ayling, Clerk, Storrington, Pulborough.

West Hartlepool.—October 27th. Corporation. Five car trucks. See "Official Notices" to-day.

CLOSED.

Australia.—*Tenders* announces the following placing of contracts:—

P.M.G.'s Department, Queensland.—

12,000 leads for Meidinger main battery.—B.I. and Helsby Cables, Ltd.
20,000 zincs, Leclanché.—I.R., G.P. and Telegraph Works Co., Ltd.

Victorian Railways Department.—

75-H.P. totally-enclosed D.C. motors for underground haulage, £300 each; contact panels, £12 10s. each; controllers with resistances, £55 15s. each.—Australian General Electric Co.
140-H.P., 415-volt, three-phase induction motor, with control, £278.—Australian General Electric Co.

Victorian Public Works Department.—

One motor F.E.P. 18, with flexible coupling for electrical installation.—I.R., G.P. and Telegraph Works Co., Ltd.

WYCHEPROOF (VIC.).—

The tenders of Messrs. R. Hornsby & Sons, Ltd., have been accepted for two suction gas engines for electric lighting plants at Wycheproof and Sea Lake.

SYDNEY.—The E.L. Committee of the Municipal Council has accepted tenders as under:—

Contact and suspension gears.—Lawrence & Hanson, Ltd., £257.
Prepayment meters.—Standard Waygood, Ltd., for Ferranti meters, £321.
Recording meters.—Australian General Electric Co., for D.C. voltmeters, £143; A.C. voltmeters, £319; and A.C. ammeters, £202.
Fibre conduit.—Haes & Eggers, Ltd., 80,000 yards of 4-in. fibre conduit, £2,625.
Bitumen.—W. G. Watson & Co., Ltd., 100 tons, £695.

The *British Australasian* says:—Orders have been placed, without calling for tenders, in London for plant and machinery for the Government electric power station. The order was placed on the advice of Messrs. Merz & McLellan, the cost to be £188,251.

Bradford.—The following tenders have been accepted by the City Council for supplies to the tramways department:—

Tangyes, Ltd.—Armature winding machine, £88; wheel-turning lathe, £868.
Leeds Engineering and Hydraulic Co., Ltd.—Two sets hydraulic jacks, £230.
Jas. Keith & Blackman Co., Ltd.—Smiths' hearths (two single and one double), £81.
Carrick & Ritchie.—Travelling crane, £535.

Canada.—According to the *Canadian Engineer* the Imperial Wire and Cable Co., Ltd., has received the following contracts:—

City of Ottawa.—47,000 ft. paper-insulated lead-covered cable, and 1,100 ft. steel taped cable, both insulated for 3,300 volts.
Toronto Hydro-Electric System.—Approximately 22,000 ft. of paper-insulated lead-covered underground cable.
City of Winnipeg.—12,000 ft. of ditto.

The *Canadian Electrical News* states that the same company has received an order for lead-covered paper-insulated underground cable for the city of Calgary; also that Brantford, Ont., has ordered the following:—

152 ornamental cast-iron standards.—Ornamental Lighting Pole Co.
151 magnetite lamps, including cut-outs and regulators.—Canadian General Electric Co.
Two 750-K.V.A. transformers.—Canadian Crocker-Wheeler Co.
Recording instruments.—Canadian Westinghouse Co.
High and low-tension switch and control equipment for sub-station.—Canadian General Electric Co.

Cardiff.—The E.L. and Tramways Committee has accepted the tender of Messrs. Fraser & Chalmers for a turbo-generator for Roath power station, at £6,345, and that of the British Westinghouse Co. for a 1,000-KW. rotary converter for Hayes sub-station, at £1,955.

East Ham.—The tender of Messrs. T. Moy, Ltd., has been accepted by the T.C. for 100 tons of 1¼-in. Kirkby nutty slack to the electricity station, at 15s. 6d. per ton.

Fareham.—The U.D.C. has accepted the tender of the Anglo-American Oil Co., Ltd., for a six months' supply of oil for the electricity works, at £4 1s. 10d. per ton.

Harwich.—The T.C. has accepted the tender of Messrs. Stuart & Moore, of Ealing, W., for the installation of electric fire alarms in the Borough. The cost is estimated at £230.

Hazel Grove.—The U.D.C. has accepted the tender of Messrs. Shaw & Co., of Stockport, for electric fire alarms.

Leeds.—The City Council has accepted the tender of Messrs. Appleyard Bros. for the erection of transformer chambers as follows:—Elder Road, £277; Westover Street, £189; and Viaduct Tannery, £130.

London.—L.C.C.—The Highways Committee accepted tenders as under for the purchase and removal of old tramway materials:—

1. Old materials in connection with the reconstruction of the King Street and Goldhawk Road tramways and the Hammersmith loop line:—
   (*a*) 320 tons of rails.—P. & W. MacLellan, Ltd.
   (*b*) 48 tons of fishplates, tiebars, &c.—G. Cohen, Sons & Co.
   (*c*) 10,000 sq. yd. of Jarrah wood paving blocks.—J. W. Pullen.
2. Old materials at the County wharf for a period of 12 months:—
   (*a*) 700 tons of steel rails.—S. Menzel.
   (*b*) 100 tons of steel points and crossings.—G. Cohen, Sons & Co.
   (*c*) 400 tons of steel fishplates, cuttings from rails and short pieces of rail.—S. Menzel.
   (*d*) 300 tons of iron (cast).—C. A. Robinson & Co.
3. Old material at the Central car repair depôt for 12 months:—Iron and steel heavy scrap, steel turnings and borings, and steel car tyres.—D. McCall & Co.

The Highways Committee has accepted the tender of Messrs. Kerridge & Shaw for the provision of foundations required in connection with the substitution of turbines for the existing reciprocating engines at the Greenwich generating station.

The following tenders were received for the H.T. switchgear, &c., for Greenwich generating station:—

Bertram Thomas (incomplete tender)		£10,838
British Westinghouse Co., Ltd.	(accepted)	17,915
British Thomson-Houston Co.		20,112
Siemens Bros. Dynamo Works		20,674
Ferranti, Ltd.		22,904
Johnson & Phillips, Ltd.		22,886
A. Reyrolle & Co., Ltd.		24,851

Estimate of chief officer of tramways, £18,000.

The firm are to be allowed to sublet the following portions of the work:—(1) To Johnson & Phillips, Ltd., cables; (2) to the British Thomson-Houston Co., Ltd., coupler switches and regulators; (3) to the Morgan Crucible Co., Ltd., carbon resistances; and (4) to Everett, Edgcumbe & Co., Ltd., relays.

The following tenders have also been accepted:—

Condensing water pipes, &c., in the bed of the Thames at Greenwich generating station.—J. Cochrane & Sons, Ltd.
Steam pipes and fittings for Greenwich extensions.—Rodney Foundry Co., Ltd.

During the recess Messrs. Williams & Bach asked to be released from their contract of March last, for the wiring of the Camberwell and Cressy Road carsheds at £2,140, and the next lowest tender, that of Electrical Installations, Ltd., at £2,146 was accepted. The tender of H. L. Holloway for foundations for rotary converters at Shoreditch sub-station, and provision of additional workshop accommodation at £1,535 was accepted.

The tender of the British Westinghouse Co. has been accepted for the supply of 13 reactance coils and two steel valve chests required in connection with the provision of protective devices, &c., for the existing Greenwich plant, at £5,943.

A 20-ton weighbridge for the Belvedere Road depôt is being purchased from Messrs. Ashworth, Son & Co., Ltd., at £148, less £12 for the old weighbridge to be removed.

The tender of the National Rail and Tramway Appliances Co., Ltd., for five hydraulic jacks at £35 10s. each, for the tramway department, has been accepted.

The tender of the Carborundum Co., Ltd., for rail grinding blocks for the tramway department for one year, at 4s. 6d. per block, has been accepted.

STEPNEY.—The B.C. Electricity Committee received the following tenders for 25 street disconnecting boxes :—

	Price each.
Universal Electrical Manufacturing Co.	£4 19 0
Henley's Telegraph Works Co., Ltd.	6 0 0
B.I. and Helsby Cable Co.	6 5 0
J. Every	8 5 0
Reason Manufacturing Co., Ltd.	8 17 6
	(less 2½ per cent.)
Johnson & Phillips	9 10 0

HAMMERSMITH.—The Electricity Committee has received the following tenders for the supply of high and low-tension underground electric cables for 12 months, of the following sizes :—High-tension, '25, '1, '05 ; low-tension, '3, '2, '15, '1, '08, '05, '025, $\frac{7}{.2}$ twin.

	Per drum of each size.
J. Littauer (Kabe'fabrik A.G.)	£650
R. R. Todd	743
Standard Cable Co.	807
A.E.G. Co., Ltd.	810
Western Electric Co., Ltd. (recommended)	825
Pirelli, Ltd.	833
General Electric Co., Ltd.	836
Siemens Bros., Ltd.	838
Johnson & Phillips	848
General Cable Manufacturing Co., Ltd.	848
W. T. Henley's Telegraph Works	849
General Cable Manufacturing Co., Ltd.	876
British Ins. and H. Cables	878
Electrical Engineering and Equipment Co.	906
W. T. Glover & Co.	914
Union Cable Co.	915
Callender's Cable and Construction Co., Ltd.	1,039

For the supply of high-tension switch panels, the estimated number required for the ensuing 12 months is 24. The tenders were :—

	Per panel.
Switchgear & Cowans, Ltd. (recommended)	£9 11 8
Edison & Swan Electric Light Co.	9 15 0
Spagnoletti	11 5 0
Ferranti	15 0 0
Electric Construction Co.	16 16 0
Johnson & Phillips	17 0 0
General Electric Co., Ltd.	17 12 0
Electrical Engineering and Equipment Co.	19 0 0
Thomas	19 5 0
Siemens Bros.	21 10 0
British Westinghouse Co.	21 10 0
Reyrolle & Co.	22 15 0
Eckstein, Heap & Co.	24 10 0
Voigt & Haeffner	28 10 0
Laing, Wharton, Ltd.	52 0 0
Do. do. (alternative)	48 0 0

For the supply of one 125-B.H.P. A.C. motor, for Messrs. Gwynnes :—

Fuller Electric Manufacturing Co.	£268
Brush Electrical Engineering Co.	294
City Electrical Co.	295
General Electric Co. (recommended)	324
Phœnix Dynamo Manufacturing Co.	325
Electric Construction Co.	328
T. Harding Churton & Co.	328
British Westinghouse Co.	330
Vickers, Ltd.	353
Campbell & Isherwood	458
Geipel & Co.	310

The Committee reports that it has had under consideration the tenders for the construction of coal-handling and storage plant, but is not yet able to submit any recommendation thereon.

Melton Mowbray.—The U.D.C. has accepted the revised plans of Messrs. Dawson & Manfield for the construction of a refuse destructor on the site of the old sewage works. The estimated cost is £2,150.

Newport (Mon.).—The T.C. is recommended to accept the tender of Messrs. Heenan & Froude for a refuse destructor, at £7,967.

The Electricity and Tramways Committee of the T.C. has accepted the tender of Messrs. James & Emanuel for 2,000 tons of coal ; that of Messrs. Partridge, Jones & Co. for 3,000 tons ; and that of the United National Collieries for 1,000 tons.

Orsett (Essex).—The B. of G. has accepted the tender of the New Telephone Co. for installing electric bells in the new workhouse premises at £53.

Oxford.—For installing the electric light at the Y.M.C.A. buildings the tender of Messrs. Hill, Upton & Co. has been accepted.

Ramsbottom.—The Traction Committee has accepted the following tenders :—

Polack Tyre and Rubber Co., Ltd., Manchester, for tires for cars for 12 months.
Rawlinson, for a tower wagon.

Shanghai.—The following tenders were received by the Municipal Council for the extensions at Riverside power station :—

BOILERS.

Howden Boiler Co.		£13,162	20 weeks
Babcock & Wilcox, Ltd.	(accepted)	14,803	2 in 16 weeks 2 in 22 weeks
Niclausse Boiler Co.		15,690	32 weeks
Clarke, Chapman & Co.		16,188	26 weeks

TURBO-ALTERNATORS.—COMPLETE TENDERS.

Name of firm.	Price. £	Speed R.P.M.	Delivery weeks.	Full-load steam lb.	Vacuum %
Allgemeine Elektricitats Gesellschaft* (accepted)	22,310	3,000	26/30	12·6	93
Maschinenfabrik Oerlikon	22,975	3,000	36/41	13·29	92
Brown-Boveri	25,134	3,000	17/52	13·6	92
Willans-Siemens	25,328	3,000	46/50	13·05	93·3
Maschinenfabrik Oerlikon	26,113	1,500	36/41	13·23	92
Turbo-Electric	27,087	1,500	42/56	13·2	93
A.E.G.	28,260	1,500	18/22	12·6	93
Escher Wyss-Siemens	28,499	1,500	—	13·3	91
Belliss-General Electric Co.	28,566	1,500	52/61	—	—
Dick, Kerr & Co.	29,037	1,500	80/88	13·7	93·5
Brown Boveri	29,834	1,500	17/31	13·6	92
Willans-Siemens	30,364	1,500	44/52	13·1	93·5
C. A. Parsons & Co.†	30,862	1,500	52	12·9	93·8
Belliss-Siemens	31,588	1,500	52/61	13·1	94
British Westinghouse Co.	31,845	1,500	36/40	13·2	93·35
Brush Co.	32,014	1,500	52/65	14·1	93·3
C. A. Parsons & Co.	32,600	1,500	52	12·8	93·3
British Thomson-Houston	32,699	1,500	54	12·7	93·3

* Add £200 for testing at full load.
† Small condenser.

PART TENDERS.

Name of firm.	Price. £	Speed. R.P.M.	Delivery weeks.	Full-load steam.	Vacuum %
Howden-Brown Boveri*	25,032	1,500	40/44	12·8 lb.	93·3
Fraser & Chalmers†	16,170	3,000	—	14·0 lb.	92·5
Fraser & Chalmers†	21,245	1,500	—	13·3 lb.	92·5

* Omits condensing plant value £7,000. † Omits condenser spares and other matters.

CONDENSING PLANT.

Name of firm.	Price. £	Cooling surface. Sq. feet.	Delivery weeks.
Worthington Pump Co.	6,727	12,000	26
Rees Roturbo Co.	7,468	12,000	30
Isaac Storey & Co.	7,210	12,000	28
Allen Son & Co.	7,509	12,000	22
Mirrlees Watson Co.	7,547	12,000	38

Torquay.—The T.C. has entered into contracts with Messrs. Whiteway & Ball and Renwick, Wilton & Co. for 3,000 tons of Featherstone washed peas and 1,500 tons of Cowper 1-in. nuts, respectively, for the electricity works.

Wakefield.—The Electricity Committee has decided to obtain a Babcock & Wilcox boiler, superheater and stoker, at £2,410 ; a Belliss & Morcom steam turbine, alternator, condensing plant, &c., at £7,703 ; and sub-station switchgear, at £1,471.

Walsall.—The T.C. has accepted the tender of the British Thomson-Houston Co., Ltd., at £25 12s. 6d., for an additional electric motor for the Council's boiler house.

FORTHCOMING EVENTS.

Electro-Harmonic Society.—Friday, October 17th. At 8 p.m. At Holborn Restaurant. Smoking Concert.

Greenock Electrical Society.—Friday, October 17th. At 7.45 p.m. At Temperance Institute, West Stewart Street. Paper on "Motor-driven Machinery," by Mr. W. A. Toppin.

Manchester Electro-Harmonic Society.—Friday, October 17th. At 7.45 p.m. At Albion Hotel. First concert.

Association of Mining Electrical Engineers (West of Scotland Branch). Saturday, October 18th. At 4.30 p.m. At Royal Technical College, Glasgow. Opening meeting.

National Association of Colliery Managers (Kent Branch) and Association of Mining Electrical Engineers (London Branch).—Saturday, October 18th. At 3 p.m. At Hotel Metropole, Dover. Joint meeting. Paper on "Large Prime Movers and Boilers for Power Houses," by Mr. E. Kilburn Scott.

Institution of Electrical Engineers (Newcastle Section).—Monday, October 20th. At 7.30 p.m. At Armstrong College, Newcastle. Inaugural address by Mr. C. Vernier.
Thursday, October 23rd.—At 7 p.m. At the Lit. and Phil., Middlesbrough. First meeting of the Tees-Side members. Address by Mr. Vernier.

Institute of Marine Engineers.—Monday, October 20th. At 8 p.m. Paper on "The Gyroscope and Gyroscopic Action in Engineering Practice," by Mr. T. R. Thomas.

Society of Chemical Industry (Newcastle Section).—Monday, October 20th. At 8 p.m. At the Chemical Theatre of Armstrong College. First of five lectures on "Utilisation of Fuel," by Prof. J. W. Cobb, B.Sc.

Junior Institution of Engineers.—Monday, October 20th. At 8 p.m. At Institution of Electrical Engineers, Victoria Embankment. Paper on "Modern By-Product Coking," by Mr. G. S. Cooper, B.Sc.
Friday, October 24th.—At 39, Victoria Street, S.W. Paper on "Mechanical Advertising and Similar Appliances," by Mr. H. W. Sewell.

Institution of Engineers and Shipbuilders in Scotland.—Tuesday, October 21st. At 8 p.m. At Rankine Hall, 39, Elmbank Crescent, Glasgow.

Chemical Society.—Thursday, October 23rd. At 8.30 p.m. At Burlington House, Piccadilly, W. Ladenburg Memorial Lecture, by Prof. F. S. Kipping, D.Sc.

Physical Society of London.—Friday, October 24th. At 5 p.m. At the Imperial College of Science, Imperial Institute Road, South Kensington, S.W. Papers on "The Ice Calorimeter," by Mr. Ezer Griffiths, B.Sc. ; "An Electrostatic Oscillograph," by Messrs. H. Ho and S. Koto.

Institution of Mechanical Engineers.—Friday, October 24th. At 8 p.m. Paper on "Modern Flour Milling Machinery," by Mr. R. B. Creak.

Manchester Association of Engineers.—Saturday, October 25th. At "Masonic Room," Grand Hotel, Aytoun Street, Manchester. Paper on "Engineering Workshop Organisation," by Mr. Hans Renold.

NOTES.

"F" Rays.—The word "ray" is a power to conjure with, and since the application of the letter "X" to a certain kind of ray, it has become the fashion to designate new rays by letters of the alphabet. What "F" stands for, we do not know; but we can make a shrewd guess as to what it ought to stand for in the case of the "rays" now being exploited by Signor Giulio Ulivi, their reputed author. Hitherto we have ignored the matter as unworthy of notice, but the prominence given to it in the columns of the daily Press renders it desirable that we should refer to it. We read that the inventor is now negotiating with the Italian Government, and threatens to come to England with the rays if Italy won't have them. To save time and space, we may say at once that most of the statements regarding the alleged rays that we have seen are purely nonsensical. The inventor is reported to have said that when he directed the rays upon a gas-meter, it exploded. If his other claims are on a par with this one—and they seem to be of a similar nature—they are utter piffle. We apologise to our readers for mentioning the matter.

Late Legal.—Eversheд & Vignoles *v.* Paul.—In the Chancery Division, Mr. Justice Neville had before him on Wednesday, October 15th, this action, by which the plaintiffs sought to restrain an alleged infringement of their trade-mark "Megger," and from a general passing off of the defendant's goods as and for the goods of the plaintiffs by the use by the defendant of the word "Omega."

Mr. Walter, K.C., and Mr. Sebastian were counsel for the plaintiffs, and the defendant, Mr. Robert W. Paul, was represented by Mr. Colefax, K.C., and Mr. Beyfus.

In opening the case, Mr. Walter said that the plaintiffs were the well-known electrical apparatus manufacturers carrying on business at Acton Lane, Chiswick, and for their measurement instruments they had obtained a great reputation. They had been carrying on business for a long time making various electrical instruments, and, amongst others, they made an instrument for calculating resistances in electric installations—an instrument for detecting leakages. Prior to 1903 it was known as an ohmmeter, but in that year the plaintiffs, being desirous of having a distinctive trade-mark, Mr. Vignoles invented a horrible word which, like a good many horrible words, became popular. The plaintiffs registered the word "Megger," as their trade mark, it was applied to these instruments for determining leakage, and "Megger" soon became usual to denote these particular instruments. They had a very large sale and were bought by all sorts of people. Counsel said he was astonished at the various classes of persons who purchased these instruments. They included those connected with the electrical industry, drapers, ironmongers, timber merchants, cement merchants and salt merchants. The instrument was asked for by these people as the Megger, but they spelt it in all sorts of ways—Mega, Megga, Meger, Megar and Meggar. In 1911 the defendant commenced to manufacture these things, and he put them on the market, advertised them and exhibited them at the Electrical Exhibition at Olympia, as Harris's low-reading ohmmeter and Harris's portable ohmmeter. In 1912, however, he proceeded to christen his instrument the "Omega," the plaintiffs complained, and though at first he expressed his intention of calling it "Paul's Insulometer," he afterwards refused to abandon the use of the word Omega. In the electrical trade people would perhaps not confuse the Omega instrument for the plaintiffs' Megger, but with the outside public, Counsel contended, the words were so nearly alike as to lead to confusion and constitute an infringement of the plaintiffs' trade mark.

Mr. E. B. Vignoles, a director of the plaintiff company and business manager, gave evidence in support of their case. This class of instrument, he said, was to be found at almost every electric station, and besides a large demand from shippers for supplying orders abroad, a large number of people who had electric installations bought them. The plaintiffs' instrument was usually asked for as a Megger. Their sales were now between 1,200 and 1,500 a year, and were steadily increasing.

Counsel, in cross-examination, put to the witness a number of cases in which the word Omega was used in connection with electrical instruments.

Mr. Astbury took objection on the ground that the only defence pleaded was that the word Omega did not so nearly resemble the word Megger as to be calculated to deceive.

Mr. Colefax submitted that he had a right on that question to tender evidence as to the frequent use of the Omega either as a word or in the form of the Greek symbol. Mr. Justice Neville thought the evidence important, and would either adjourn the case then or hear it out so far as he could, reserving to Mr. Astbury the right to have an adjournment for the purpose of considering the evidence.

After consultation with his client, Mr. Astbury said he had seen the evidence Mr. Colefax intended to produce as to the use of the word Omega, and he did not feel justified in advising his client to go on with the action. Under the circumstances, he would consent to the action being dismissed, but inasmuch as this evidence could not have been adduced without amendment of the pleadings, he submitted the action should be dismissed without costs. There was evidence that Omega had been used in connection with test instruments prior to 1901, but the plaintiffs knew nothing about it, and had they done so the action might never have been brought.

Mr. Colefax submitted that the action should be dismissed with the usual consequences that, had the action gone on, he should have contended that in any event Omega was not a colourable imitation of the plaintiffs' trade mark.

His Lordship said it was difficult to determine what should be done as to costs. He thought, however, justice would be done if he dismissed the action with costs, but gave a direction to the taxing master that the defendants were not to be allowed any costs of witnesses who would have been called to speak to the use of the word "Omega."

Subsequently counsel stated that the parties had been able to arrange an order, and his Lordship made the order in the terms agreed.

B.E.A.M.A. Annual Dinner.—The annual dinner of the Association will take place on Wednesday, January 21st, 1914. Lord Ampthill will preside.

The Late Dr. Diesel.—A daily Press report says that a body was found in the Scheldt on Saturday, and some articles on the body have been recognised by the son of the late Dr. Diesel as being the property of his father. A Berlin dispatch states that Dr. Diesel's family is left entirely without means and in the greatest need.

A Munich dispatch to the newspapers says that at a meeting of creditors held there, it was shown that Dr. Diesel's financial collapse was due to extensive and unlucky speculation in real estate and house property, which followed upon his failure in a costly lawsuit. It is understood that the inventor's admirers purpose raising a pension fund on behalf of the widow.

Appointments Vacant.—Chief assistant electrical engineer for Tunbridge Wells (£170); assistant sales manager for Sunderland Corporation (£200); consumers' clerk for Greenock Corporation; assistant telegraph engineers for Government of Federated Malay States (salary, £360: duty allowance, £75).

Automatic Train Control.—A system of controlling trains, known as the "Detroit," has recently been tested with successful results on the Canadian Pacific Railway. Visual and audible signals are given in the driver's cab, and are repeated to the train dispatcher; the speed of the train is automatically reduced when it passes a "caution" signal, and the brakes are put on if it over-runs a danger signal. The derangement of any part of the mechanism puts the signals to danger. High-frequency alternating currents in wires laid alongside of the track, with receiving apparatus on the locomotive, are employed, so that the system evidently resembles the Railophone system which was successfully demonstrated in this country in 1911 and last year, and the Prentice system, which we described on August 29th last.

The Kelvin Memorial at Glasgow.—A statue of Lord Kelvin in Kelvingrove Park, Glasgow, was unveiled on 8th inst. by Mr. Birrell, Lord Rector of the University. After giving a brief sketch of the celebrated scientist's career, including the years spent at Cambridge, and especially the very lengthy period during which he held the Professorship of Natural Philosophy at Glasgow, Mr. Birrell performed the ceremony, and afterwards he and Sir J. Stirling Maxwell were presented with the freedom of the city. At the luncheon which followed, Mr. Balfour delivered an interesting address in proposing "The Memory of Lord Kelvin." A message of appreciation from Lady Kelvin was communicated. Mr. Balfour referred to the life and work of Kelvin as showing the close connection between theory and practice. He also declared that the fame of Kelvin did not depend upon statues. It rested upon the sure foundation of the gratitude with which posterity would regard achievements which had never been surpassed in the annals of physical science.

A Model Exhibition.—During the past week an exhibition devoted to "model engineering" has been in progress at the Horticultural Hall, under the auspices of Messrs. Percival Marshall & Co., proprietors of *The Model Engineer*. In a different sense the exhibition is a model one, for apparently it was ready at the appointed time, and it is packed full of interest to the rising generation of engineers—who, it is to be hoped, will ever continue to be model engineers—as well as to many of their elders. Wireless telegraphy is very fully represented, exhibits having been organised by Messrs. A. W. Gamage, Ltd., the British Telegraph Instrument Co., Ltd., the Static Scientific Co., and the Synchronome Co., Ltd., while the British School of Telegraphy, Ltd., had a good show. Electrical apparatus of various kinds were exhibited on many of the stands, and numerous examples of amateur work, showing a high standard of merit, were entered for the model-making competitions.

Underground Mail Tubes.—The Electric Carrier Co., of New York, has given a demonstration of a new device for carrying heavy mail sacks in underground tubes, and will shortly submit proposals to the British Post Office for the adoption of its system in London. The new system consists of a steel tube, 36 in. in diameter, through which run steel cylindrical cars, weighing about 1,200 lb. These are propelled by a magnetic push or pull, without wheel traction. The cars are centrally controlled, and one man operates them by a system of push-buttons. The whereabouts of the cars in the tube is indicated by signal lights. The inventors claim that the cars differ from any others in that they have practically no mechanism attached, and can be sent through the tube at a 15-second headway at a speed, on a level stretch, of from 100 to 200 miles an hour. The cost of the system is estimated at £10,000 per mile, and the cost of maintenance only 5 per cent. of the total investment.—*Daily Telegraph.*

(*Continued on page* 623.)

THE CHESTER HYDRO-ELECTRIC PLANT.

The ancient city of Chester and its pleasant river are probably well known to a considerable number of our readers, few of whom, however, would be likely to suspect any direct connection between its old-time associations and one of the most modern of its institutions—the Corporation Electrical Department.

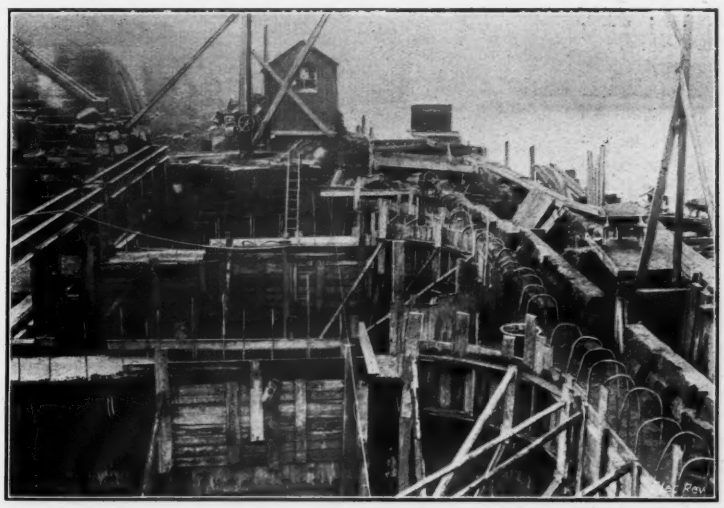
Yet in this, as in other cases, the unexpected has happened, for the stone weir, with which visitors to the town who have crossed the Dee Bridge will be familiar, and which it is recorded was constructed in Norman times by Hugh Lupus, Earl of Chester (A.D. 1070-1101) for the working of corn mills and for fishery purposes, has now through the instrumentality of Mr. S. E. Britton, the city electrical engineer, been turned to very good account by the Corporation for the production of electrical energy.

Indeed, the civic history of Chester, for which space is naturally lacking here, hinges to an almost remarkable extent on the weir constructed by Hugh Lupus, which through nine centuries formed a source of power not only for corn milling at the Dee Mills, but also between A.D. 1600 and 1700, for the pumping of the water supply of the city, and more latterly (1896-1897) for sewage pumping, by means of a water turbine and pump, this installation, however, having now given place to a modern electrically-driven plant.

Flour milling at the Dee Mills appears to have been a hazardous industry, as numerous fires are recorded, and it was after a fire in 1895 that the mills, four in number, were acquired by the Corporation, and finally discarded for milling purposes three years later. In 1910 it was decided to remove the buildings, and it was then that Mr. Britton took up the question of utilising the available power for generating electricity.

The scheme which he submitted to the Electricity Committee of the Corporation was a particularly attractive one, both from a commercial and layman's point of view, as it showed that the annual surplus would recoup the capital expenditure in five years; the scheme was finally submitted to Mr. A. C. Hurtzig, who fully agreed with Mr. Britton's proposals.

The New Hydro-Electric Power House, Chester.

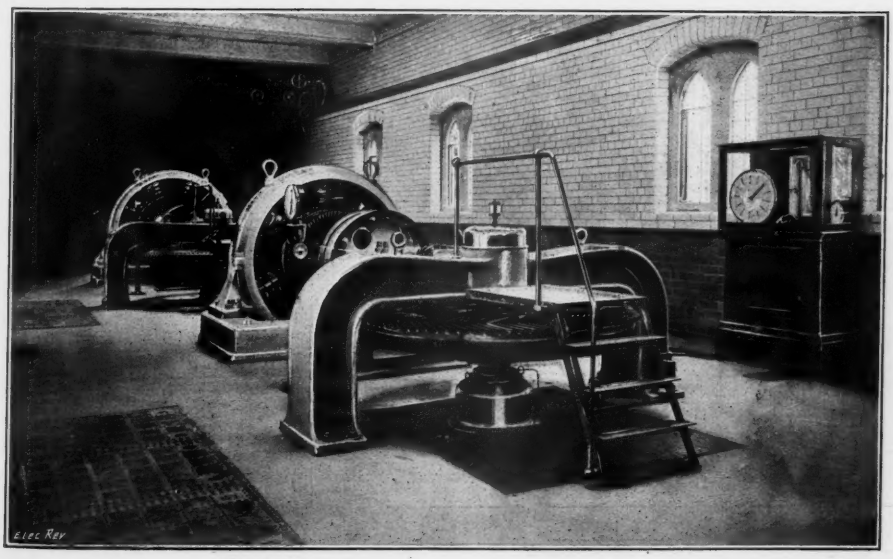


Reinforced Concrete Construction; Turbine Pits.

The Electricity Committee has undertaken that in the working of the installation the water from the river above the weir shall not be lowered more than 6 in. below the mean height of the weir. By agreeing to this level all interests in the river will be in a better position than frequently occurred in the days of the working of the Old Dee Mills.

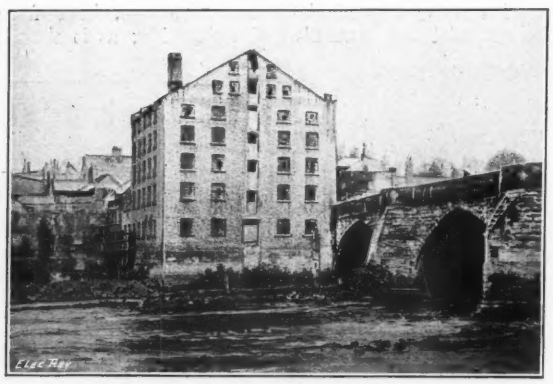
The scheme is a unique one, being situated at a place on the river affected by tidal waters, and special consideration had to be given to the influence of the latter upon the plant; to obtain the best results it was necessary to adopt specially-designed turbines and dynamos capable of working efficiently over a wide range of speeds, resulting in the overall efficiency at all times being considerably higher than the usual practice of constant-speed plant.

It is calculated from the level of the flow



Interior, Showing the Electrical Plant, Gearing, &c.

that the average cb. ft. per min. of fresh-water flow at different months of the year is as follows: December, 300,000; January, February and March, 100,000; April, May, October and November, 50,000; June, July, August and September, 20,000; and the lowest dry weather flow is about 10,000 c.f.m. The effect of the above varying flow is to give the following average head in feet:—December, 4·5; January, February and March, 6·25; April, May, October and November, 7·5; June, July, August and September, 8·75.



The Old Dee Mills, which occupied the Site of the New Works.

The weir is placed diagonally across the river at the east side of the Old Dee Bridge and forms a channel to conduct the water to the site of the power house. As the water approaches the latter, it passes through a strainer rack and sluice gates.

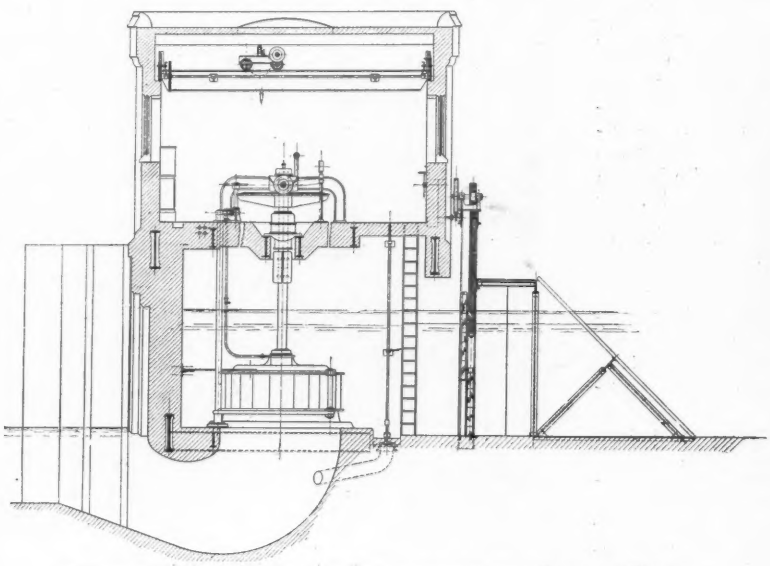
The power house, 89 ft. long × 24 ft. 6 in. wide, and measured from the bottom of the head race, 36 ft. high, is mainly constructed of steel and concrete, faced externally with sandstone rock and lined with glazed brick. The under-water work forming the head race, the three turbine pits, and the tail race is of concrete and steel. On the external face of the down stream side of the turbine pits are placed three cut waters and gothic arches; these and the filling-in of sandstone harmonise with the adjoining bridge. The retaining wall between the bridge and the power house and 121 ft. of river wall beyond the power house has been entirely rebuilt in ashlar with sandstone taken from the foundations of the old mills.

Three turbines are installed, of the vertical shaft Francis type, specially designed by Messrs. James Gordon & Co., for working under a head of water varying from 1 to 9 ft.; two turbines are designed for dealing with 30,000 c.f.m. under an actual working head of 9 ft., and are capable of developing 415 B.H.P. at a speed of 50 R.P.M., while the other is designed for dealing with 22,000 c.f.m. under similar conditions, and is capable of developing 305 B.H.P. at 55 R.P.M.

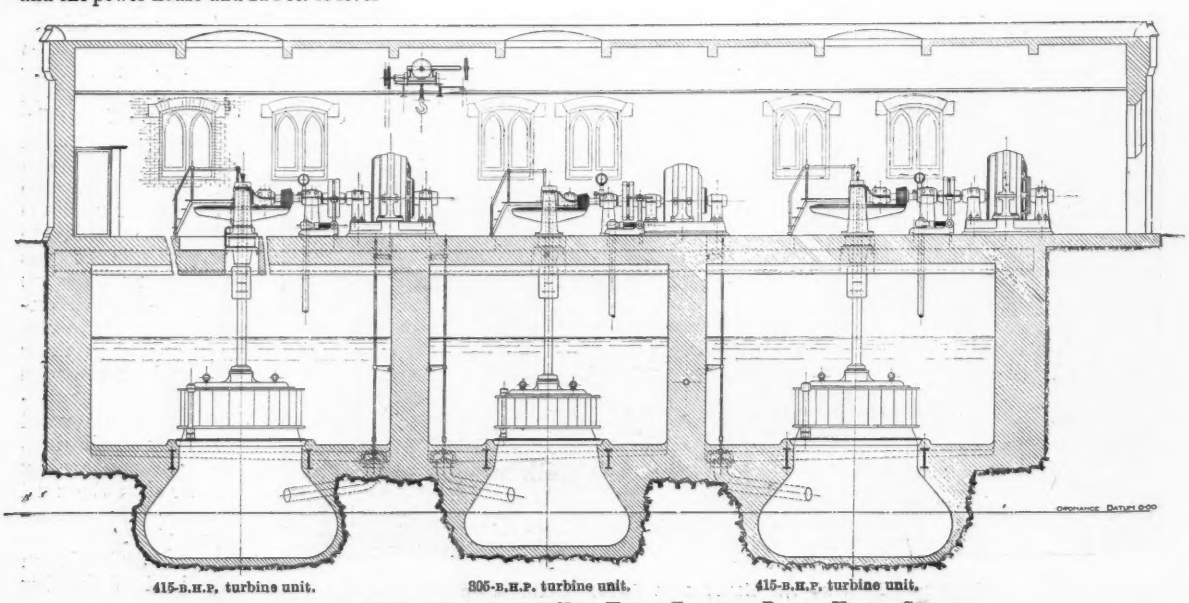
The turbine runners are constructed with buckets of forged steel plate securely cast into a centre boss and surrounding ring of cast-iron; the guide casing is of cast-iron, also the guide blades, which are bushed with gun-metal and mounted on steel spindles; the closing edges of the guide vanes are ground to ensure a close water-tight pit when closed, and the vanes are coupled by links and shafting to the hand regulating gear.

Each turbine is provided with a set of hand-operating gate gear mounted on the generator floor, including an indicator to show the position of the guide gates.

The revolving weight of the turbine shaft, runners and bevel gear is supported by a specially designed collar suspension bearing, fitted at the upper end of the vertical shaft on the generator floor; the thrust rings of the suspension bearing are submerged in oil, which is kept in circulation by an arrangement of grooves and oil hobs.



Sectional View, Showing Arrangement of Hydro-Electric Unit.



Longitudinal Section through the New Hydro-Electric Power House, Chester.

Each turbine is provided with a tachometer, and a handsome head and speed gauge is installed. This gauge records on a large daily chart the available head of water, and also indicates the head under which the turbines are working and the correct speed at which the turbines should be working.

A wrought-iron strainer rack is provided across the full width of the head race, and to facilitate cleaning it, a platform is placed at a level which is well above headwater.

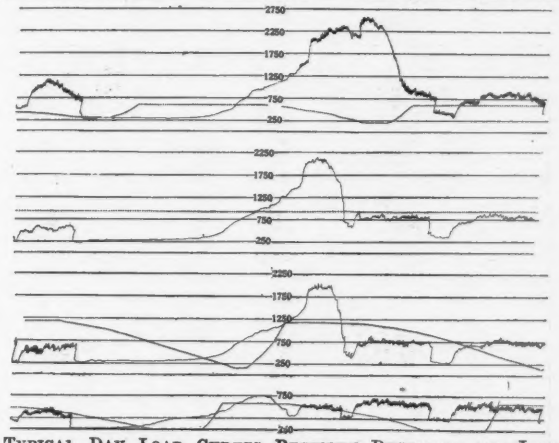
There are three complete sets of sluice gates, each consisting of two gates of the double lifting type, with a double set of headgear, operated inside the power house by one man.

The turbines are coupled through machine-cut steel helical bevel gear and flexible couplings to shunt-wound interpole generators, constructed by the Lancashire Dynamo and Motor Co. The two large generators, each have an output of 225 KW., at a speed varying between 143 and 285 R.P.M., while the output of the smaller generator is 185 KW., at any speed between 167 and 300 R.P.M.; the pressure is 440-500 volts.

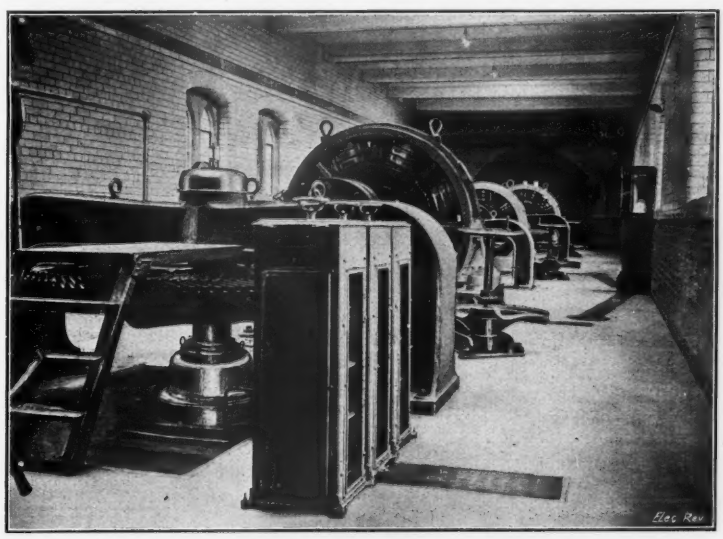
Although the normal maximum speed of either machine is, approximately, 300 R.P.M., the armatures are specially constructed so that they may be safely run at 500 R.P.M., without fear of damage. The higher speed is given when the load is instantaneously thrown off the turbine as, for instance, in the event of the generator circuit-breaker operating.

Special attention has been paid to the insulation throughout the machines, so that it may withstand the action of damp atmosphere.

The generators are controlled from a Crompton switchboard erected at one end of the power house, consisting of three enamelled slate panels on which is mounted the usual apparatus for the control of direct-current generating plant. The current generated is conveyed by three lead-sheathed and steel-armoured cables, laid direct in the ground, to a sub-station at the Cross. As much of the current as is required to meet the demand of that area is distributed at the sub-station, the balance is sent to the steam generating works at New Crane Street, where it passes through a reversible booster, and is either sent out to other areas of supply, or stored in a battery in readiness for the next peak load.



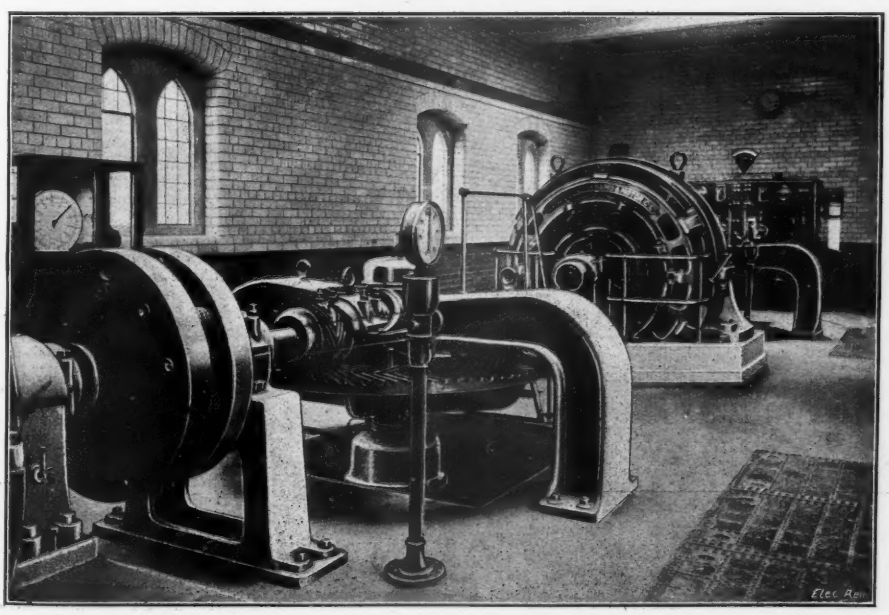
Typical Day Load Curves Between December and June of Steam Station, with Estimated Hydro-Electric Output on those Dates Superposed (Dotted Line).



Generating Plant, Chester Hydro-Electric Works.

The arrangement of plant provides flexibility and economical running under the varying conditions of flow and head, as one unit will deal with the dry weather flow, two with the average flow and three with the wet weather flow and low heads. It is estimated that the installation will yield about 1,250,000 units per annum at a cost including capital charges of rather less than ·3d. per unit.

The scheme includes several interesting constructional features, which we are unfortunately unable to do more than indicate, viz., the suspension bearing for the turbine runners, &c., carrying a weight of about 6½ tons; the adjustable ball thrust bearing in proximity to the Citroen gear for giving minute adjustments to the latter; the flexible coupling—a speciality of Messrs. Gordon—in which an endless rope interwound between the projecting pins of the two halves



Arrangement of Flexible Coupling, Citroen Gearing for Generator Drive.

of the couplings, gives the required flexibility not only in the direction of rotation but also for end play, the latter a source of considerable wear with other similar types of coupling, which the rope feature is said to overcome ; also the sluice gates, constructed in two parts, the lower one of which opens

Removing the Old Foundations.

to the full extent before the upper one is lifted, the arrangement being such that one man can operate the double sluice gate.

In Mr. Hurtzig's report, he estimated that Mr. Britton's scheme would cost some £12,500, allowing over 10 per cent. for contingencies, and basing capital charges upon local experience, these were estimated at £858 per annum, which together with £334 for labour and management, and £134 for repairs and maintenance, gave a total annual charge of £1,326.

Mr. Britton estimated that 1,021,490 units could be usefully generated during a year, but this estimate was exceeded by Mr. J. S. Wilson, who, in an appendix to Mr. Hurtzig's report, came to the conclusion that 1,273,400 units per annum was a safe production figure.

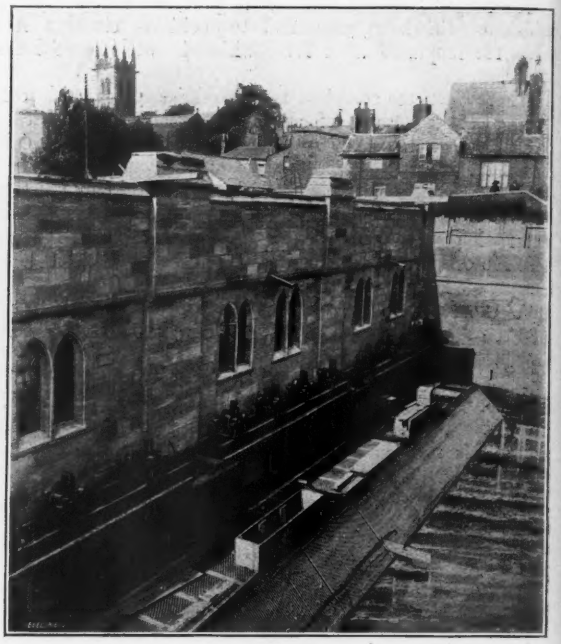
However, taking Mr. Britton's figure of 1,021,490 units

Wooden Formers for Turbine Draft Tubes.

at 1d. per unit, an income of £4,257 results ; and as the total working cost per annum as mentioned above, only amounts to £1,326, the surplus or profit should amount to £2,931.

In view of the promising nature of these estimates, the actual results obtained from the working of the plant, which is to be officially opened on Monday next, will be awaited with great interest.

The principal contractors were Messrs. James Gordon and



The Strainer Rack and Sluice Gates.

Co., of London, who constructed the building, strainer rack, sluice gates, turbines, gears, shafting, flexible couplings and travelling crane ; the Lancashire Dynamo and Motor Co., who supplied the generators ; and Messrs. Crompton & Co., who constructed the switchboard.

In conclusion, we congratulate Mr. S. E. Britton, the city electrical engineer, not only on having originated a somewhat novel scheme of considerable pecuniary value to the town, but also on having carried it to an apparently successful stage of operation. We are indebted to Mr. Britton for his assistance in connection with this article.

Electric Traction Abroad.—In a review of electric traction abroad, great progress, says the *Revue Pratique de l'Electricité*, has been made in the driving of trains by electricity in Germany, Italy, Austria, Sweden and Russia. The Prussian State railways have organised services on several lines. In 1906 the Berlin suburban line to Gross Lichterfeld was electrified (direct current) ; four years later the trial line from Niederschönwerde to Spindlersfeld, also the Blankenese-Hamburg to Ohlsdorf single-phase line were organised. A satisfactory result being shown, the Prussian Administration decided, in 1909, to electrify the Magdeburg-Halle-Leipzig section (154 km.) ; that from Laubau to Königzelt, in Silesia (129 km.) ; and a stretch of 145 km. in the Riesengebirge. In order to ensure uniformity in the equipment and the locomotives and to train the staff, the Dessau to Bitterfeld line was opened in 1911. The complete service from Magdeburg to Leipzig will be in operation in 1914. The State Railway Administration of Prussia owns 95 locomotives and 145 motor-carriages on the single-phase system. Working results on the Blankenese-Ohlsdorf line began to show satisfactory figures from the third year (1910) of operation viz., 1½ per cent. in 1910, 3½ per cent. in 1911, and 4 per cent. in 1912 on the capital disbursed ; the mileage run on the Dessau-Bitterfeld line was 30,000 to 40,000 km. The Prussian Government has laid before the Landtag a scheme to electrify the Berlin suburban railways, consisting of 400 km. of double track, 27 km. of single track, and 125 km. of auxiliary lines. The capital required will be 123,000,000 fr., 75,000,000 of which will be for rolling stock. The trains will be made up of 13 coaches, drawn by two or three motor-cars, an arrangement allowing the use of existing rolling stock. The principal section of the Stadtbahn is 13½ km. in length ; it will be served by 32 trains per hour in both directions which may be increased to 40. Electric working should be started in 1914, as the electrification is being hastened, owing to the insufficiency of the steam service. The Prussian Administration has chosen the single-phase system owing to the satisfactory results shown on the Blankenese-Ohlsdorf line, where long trains of 300 tons weight are being run ; the construction of sub-stations is, moreover, dispensed with. The State Administrations of Prussia, Bavaria, and of the Grand Duchy of Baden have officially adopted the same system

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NOTES.

(*Continued from page* 618.)

University College, Dundee.—On Monday the new engineering department was opened by Sir A. B. W. Kennedy. We shall recur to the matter in a later issue.

The "Tynemount."—The electric motor ship, *Tynemount*, has recently undergone satisfactory trials and is now nearly ready to sail on her maiden voyage.

Institution and Lecture Notes.—A meeting of the Electrical Section of the Newcastle-on-Tyne and Gateshead Chamber of Commerce was held on the 13th inst. in the Mayor's Chamber, Newcastle. Mr. C. S. Vesey Brown presiding. Mr. W. C. Mountain was elected chairman of the section for the ensuing year, and it was decided to discuss the question of tariffs for cooking, heating and lighting purposes, at a special meeting on October 27th. A report was presented to the meeting which stated, *inter alia*, that the desirability of having a uniform tariff for heating and cooking had been discussed. The committee agreed that it was almost impossible to obtain a uniform tariff, but considered that some principle might be generally agreed upon. The engineers of the various municipalities had been circularised, asking for opinions on the point, which was receiving the attention of the committee.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—MR. G. C. I. STUART, of the staff of the Manchester Corporation Electricity Works, Stuart Street, and formerly resident engineer at the Brakpan power station of the Victoria Falls and Transvaal Power Co., Ltd., South Africa, has been appointed power station superintendent of the Central Argentine Railway, Ltd., Buenos Ayres.

The salary of MR. E. ROTHWELL, electrical engineer at the Rochdale Workhouse, is to be increased from £130 to £150 per annum with emoluments, which amount to £26 per year.

MR. L. LEE, chief meter inspector of the Watford undertaking, has resigned his appointment. MR. V. A. WOODLAND, at present assistant meter inspector, has been promoted to fill the vacancy, and applications are invited for an assistant and for two junior shift engineers, owing to the appointment of the present senior shift engineer (MR. G. A. AYRE) as third assistant engineer, and the junior shift engineer (MR. ELLIS) as shift engineer.

The Stafford T.C. has appointed MR. W. H. ROBBINS to succeed Mr. Mead as electrical engineer.

The Whitehaven T.C. has received 180 applications for the post of electrical engineer in succession to MR. SANKEY.

MR. JACKSON, canvasser to the Corporation electricity department at Cheltenham, has resigned in order to take up another appointment.

The Hereford T.C. has increased the salary of MR. G. H. WATSON, assistant engineer at the electricity works, from £117 to £130 per annum.

MR. ROBERT WILKINSON, shift engineer at South Shields Corporation electricity works, has been presented with a suit case by the staff and employés, upon the occasion of his leaving to join the staff of the British Westinghouse Electric and Manufacturing Co., Ltd., at Trafford Park.

Tramway Officials.—MR. J. R. TAYLOR, of Ashton-under-Lyme Corporation Tramways, has been appointed chief clerk of the Walsall tramways at £130 a year, rising by annual increments of £10, to £160. Mr. F. Walton was formerly appointed to this position, but withdrew his application.

General.—On Friday morning last, when the pressure of the week was somewhat relaxed, the generally very tranquil offices of the ELECTRICAL REVIEW resounded with a hearty singing of the chorus "For He's a Jolly Good Fellow." For a few moments the members of all departments of the office staff on Ludgate Hill "downed tools" in order to give their cordial good wishes to MR. W. G. WICKEN on his retirement from the position of manager of the composing department, after 30 years' exemplary service with Messrs. H. Alabaster, Gatehouse & Co. Advantage was taken of the opportunity to present Mr. Wicken with a well-filled cigar cabinet, suitably inscribed. The presentation was made by Mr. E. S. Middleton (advertisement manager), after a brief address, signed by every member of the staff, had been read and presented by Mr. Albert Bridge (news editor). Every employé of the firm who could possibly manage it was present, but the days being more strenuous than they used to be, the advertisement travellers, Messrs. Osborne Pearston, H. Porter-Cox and H. G. Crabb (Electrical Directory department), were only able to be present in the spirit. Those assembled included Mr. A. H. Allen, M.I.E.E. (assistant editor), Mr. J. Osborn (publishing department), Messrs. W. B. Warwick and E. H. Howard (photographic and engraving department), Mr. P. J. Haskell (accountancy and advertisement department), &c. Mr. B. A. Tapp (sub-editor) had not yet returned from holidays. A pleasing and perhaps somewhat unusual circumstance was the lengthy service with the journal of so many of those present, seven having continued for more than 20 years, though still in the hey-day of youth. The spirit of a common interest, engendered by the friendly relations that have always existed between the principals and staff, is reflected in this record. In addition to the staff's good wishes, Mr. Wicken has also received the personal recognition of the proprietors (Messrs. H. Alabaster, Gatehouse & Co.), ensuring him of freedom from anxiety in his well-earned retirement. Mr. Wicken is succeeded by his son, MR. W. H. WICKEN, who has been connected with the department for many years.

On the occasion of the visit of the King and Queen to the London Coliseum last week, in aid of the French Hospital in London and the Charing Cross Hospital, among those who had the honour of being presented to their Majesties was MR. GEORGE VERITY (vice-chairman of the Charing Cross Hospital).

MR. LEWIS E. BURR, of the Woods Motor Vehicle Co., Chicago, has been elected president of the American Electric Vehicle Manufacturers' Association.

A Canadian Exchange states that MR. A. T. GOWARD, Victoria manager of the B.C. Electric Railway Co., recently left for England, where he will spend several months, and will discuss with the directors matters pertaining to the company's undertakings in Victoria and immediate vicinity.

The same contemporary states that MR. H. W. CURLING recently arrived in Canada to assume the position of managing director of the Canadian Electric Co. Mr. Curling was recently in South Africa, where for over three years he has been directing the operations of a London electrical company.

MR. W. BRAGG, of the machine shop staff of Messrs. Willans and Robinson, Ltd., electrical engineers, of Rugby, is leaving to set up in business for himself at Coventry, and his colleagues have presented him with a watch. MR. A. JOBEY, of the same department, is leaving to take up an appointment at Glasgow, and he has been presented with a travelling trunk, with a gold bracelet for his wife.

The staff at the Sheerness Dockyard electric power station have presented a set of carvers and pickle fork in case to MR. ARTHUR SHRUBSALL on his marriage.

MR. ROBERT ONIONS, the general manager of Messrs. Richard Hornsby & Sons, Ltd., of Stockport, who has been with that firm for a period of over 23 years, has now left them to become works manager to Messrs. Mirrlees, Bickerton & Day, Ltd., Hazel Grove, Stockport. A meeting of some 300 of Messrs. Hornsby's employés was held to bid him "good-bye," and a presentation, consisting of a silver rose bowl and a set of vases, was made by Mr. Bellamy, one of the directors of the firm, who referred to the good relations which had always existed between Mr. Onions and the directors, their appreciation of Mr. Onions' services, and their good wishes to him in his new appointment.

MR. EDWARD J. NALLY is accepting the appointment of vice-president and general manager of the Marconi Wireless Telegraph Co., of America. Mr. Nally has been for more than 35 years connected with the telegraph business, starting as a messenger boy with the Western Union Telegraph Co. He recently resigned as vice-president and general manager of the Postal Telegraph and Cable Co., after a service of nearly 25 years. His telegraph experience and reputation are expected to be especially valuable to the company in connection with the trans-Atlantic and trans-Pacific telegraph service which it is expected will be opened to the general public by the close of the present year.

MR. T. GRAY, who has been connected with the Electric Construction Co., at Bushbury, for 21 years, has just left to fill an important position in Chelmsford, and last week he was presented with a gold watch from the turning and fitting shops. Mr. and Mrs. Gray were the recipients of two umbrellas; and from his more immediate colleagues, Mr. Gray received a massive cigarette case.

MR. C. E. HUNTER, director of the Edison & Swan U.E.L. Co., Ltd., has been appointed to the board of the Altrincham Electric Supply, Ltd.

MR. H. W. ERBY this week severs his connection with Messrs. Williams & Bach, 9, Hanover Street, W., having resigned his position as manager of the electrical department.

MR. J. J. CHISWELL, late sales manager of the Brimsdown Lamp Works, Ltd., and previously for some years manager of the supplies department of the Brush Electrical Engineering Co., Ltd., has now entered into his new offices at Craven House, Kingsway. Mr. Chiswell has been established as an "electrical purchasing agent" since the beginning of the year, trading as Chiswell & Co., and is acting for several important Colonial firms. He would be glad to receive lists from manufacturers interested in the over-seas trade, particularly Canada, Australia and India.

Obituary.—MR. J. H. CAWTHRA.—News was received in South Shields on the 11th inst. of the death in South Africa of Mr. J. H. Cawthra, formerly borough electrical engineer at South Shields. It was stated that death was the result of a motor accident, but no details were then to hand. Mr. Cawthra commenced his association with electrical engineering in the North of England, when, after the completion of his apprenticeship, he entered the service of Messrs. J. H. Holmes & Co. Here he acquired experience in the construction and erection of electric generating plant. Later he became connected with the Newcastle-on-Tyne Electric Supply Co. Subsequently he served as a marine engineer, and in 1893 he gave up this work and received an appointment under a Yorkshire electrical company. He afterwards became chief assistant electrical engineer at the Leeds Corporation electricity works, and subsequently held a similar position under the Swansea Corporation. In 1901 he was appointed to South Shields, leaving there two years ago to take up an appointment under the Victoria Falls Power Co., South Africa.

MR. J. GROVER.—The death is reported of Mr. John Grover, of Heather Bank. The deceased, who was 78 years of age, established the Hindhead E.L. Co.

NEW COMPANIES REGISTERED.

Watson, Marsh & Co. (Hampstead), Ltd. (131,523).—This company was registered on October 9th, with a capital of £500 in £1 shares, to carry on the business of designers, manufacturers, exporters and importers of, and dealers in, electric light and other electrical apparatus, conduits, ynamo machines, lamps, fittings and accessories, &c. The subscribers (with one share each) are:—J. B. Marsh, 6, Hovedean Road, Cricklewood, N.W., electrical engineer; M. Cohen, 25, Brindesbury Road, N.W., electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are M. Cohen, J. B. Marsh and G. H. Marsh (all permanent). Registered by Alfred H. Atkins, Ltd., 27-8, Fetter Lane, E.C.

Newman & Co., Ltd. (131,537).—This company was registered on October 10th, with a capital of £1,000 in £1 shares, to carry on the business of electrical engineers, manufacturers of electro-plated and other metal goods, and bottles and other glass articles, &c., and to adopt an agreement with H. F. Morriss, W. Hamblett, and W. Knowles. The subscribers (with one share each) are:—W. Knowles, Alcesten Road, Wallington, incorporated accountant; H. F. Morriss, 143, Lower Road, Rotherhithe, S.E., metal merchant. Private company. The number of directors is not to be less than two or more than three: the first are W. Knowles, H. F. Morriss, and W. Hamblett (all permanent); qualification, £200. Registered office, 39, Old Paradise Street, Lambeth, S.E.

Cold Light (Dussaud Processes), Ltd. (131,482).—This company was registered on October 8th, with a capital of £18,000 in 16,000 ordinary shares of £1 each, and 40,000 deferred shares of 1s. each, to carry on the business of manufacturers of, and dealers in, electric and other lighting, and cinematograph apparatus and lamps, electricians, engineers, &c. The subscribers (with one share each) are:—L. Schloss, 3, Rangoon Street, E.C., merchant; E. A. Myer, 46-7, London Wall, E.C., solicitor. Private company. The number of directors is not to be less than three or more than ten; the first are J. H. Osborne, L. Schloss, E. A. Myer and Maria F. E. Cogni (permanent, subject to holding 500 ordinary shares), A. Leresche and C. F. Dussaud; qualification of ordinary directors, 100 ordinary shares. Registered office, 46-47, London Wall, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Radium Electro-Emanation Co., Ltd.—Particulars of £3,000 debentures, created September 18th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £1,750. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

British Continental Electricity Co., Ltd. (57,088).—Return dated July 18th (filed September 5th), 1913. Capital £20,000 in 1,000 ord. and 1,000 pref. shares of £10 each. 1,000 pref. and 998 ord. shares taken up. £16,880 paid on 790 pref. and 848 ord. £3,600 considered as paid on 210 pref. and 150 ord. Mortgages and charges: Nil.

Electrical Oil Refining Co., Ltd. (43,126).—Return dated August 6th, 1913. Capital, £5,000 in £1 shares. 4,375 shares taken up. £1 per share called up on 882. £882 paid. £3,493 considered as paid. Mortgages and charges; Nil.

Exchange Telegraph Co., Ltd. (6,152). — Return dated August 13th, 1913. Capital at date of return, £246,250 in 8,125 "A" and 16,500 "B" shares of £10 each. 8,023 "A" and 16,200 "B" shares taken up (exclusive of 102 "A" shares forfeited). £9 per share called up on 6,000 "A," and £1 per share on 2,023 "A." £56,023 paid. £179,000 considered as paid, being £10 per share on 16,200 "B" and £8 per share on 2,125 "A" shares. Mortgages and charges: Nil. Since the date of the above return, resolutions adopted with a view to reducing the "A" nominal capital to £96,430 in 8,023 "A" shares of £10 each, and 16,200 "B" shares of £1 each, by cancelling 102 "A" shares forfeited, by cancelling capital lost or unrepresented by available assets to the extent of £9 per share on 16,200 "B" shares, and by cancelling 300 "B" shares which have not been issued.

Frinton-on-Sea Electric Light and Power Co., Ltd. (70,689).—Return dated May 22nd, 1913. Capital, £10,000 in £1 shares (7,300 pref.) 1,376 ord. and 5,125 pref. shares taken up. £6,501 paid. Mortgages and charges: £6,457.

General Electric Co., Ltd. (67,307).—Return dated July 24th, 1913. Capital, £800,000 in £10 shares (40,000 pref.). 40,000 pref. and 40,000 ord. shares taken up. £10 per share called up on 33,000 pref. and 15,000 ord. £479,976 paid, leaving £24 in arrears. Mortgages and charges: £200,000.

Electrical Co., Ltd. (36,819).—Return dated May 9th, 1913. Capital, £100,000 in £5 shares. All shares taken up. £2 12s. 6d. per share called up on 17,000 and £2 on 3,000. £50,625 paid. £9,000 (£3 per share) considered as paid on 3,000. Mortgages and charges: Nil.

Electric and General Investment Co., Ltd. (31,506).—Return dated July 8th, 1913. Capital, £201,500 in 20,000 ord. and 19,900 pref. shares of £5 each, and 40,000 def. shares of 1s. each. All shares taken up. £1 per share called up on the ord., and £5 on the pref., and 1s. on the def. £121,500 paid. Mortgages and charges: £29,570 10s.

James Keith & Blackman Co., Ltd.—A memorandum of satisfaction in full (*a*) on September 15th, 1913, of debenture dated February 9th, 1904, securing £100; and (*b*) on September 17th, 1913, of debenture dated January 3rd, 1911, securing £150, has been filed.

Issue on September 24th, 1913, of £250 debentures, part of a series of which particulars have already been filed.

La Plata Electric Tramways Co., Ltd.—Trust deed dated September 10th, 1913, (supplemental to trust deeds of May 26th, 1909, and January 31st, 1912), to secure £100,000 5 per cent. first mortgage debenture stock ranking *pari passu* with £30,000 and £70,000 like stock created under the deeds of 1909 and 1912 respectively. Property charged (specifically): Concessions, lands, tramways, buildings, &c., specified in the second schedule to the principal trust deed. (As a floating security): The company's undertaking and other assets, present and future, including uncalled capital. Holders: River Plate Trust, Loan and Agency Co., Ltd., 52, Moorgate Street, E.C.

Henley's (South Africa) Telegraph Works, Ltd. (77,781).—Return dated August 1st, 1913. Capital, £2,000 in £1 shares. 2,000 shares taken up. £2,000 paid. Mortgages and charges: Nil.

Clarke, Steavenson & Co., Ltd. (57,821).—Return dated August 25th, 1913. Capital, £3,000 in £1 shares. All shares taken up. £1 per share called up on 1,400 and 15s. per share on 1,600. £2,600 paid. Mortgages and charges: £500.

Malaga Electricity Co., Ltd. (48,076).—Return dated July 22nd, 1913. Capital, £57,000 in 10,000 ord. shares of £5 each and 7,000 def. shares of £1 each. All shares taken up. £5 per share called up on 10,000 shares. £50,000 paid. £7,000 considered as paid on 7,000 shares. Mortgages and charges: £34,131.

Halifax and Bermudas Cable Co., Ltd. (28,972).—Return dated September 18th, 1913. Capital, £50,000 in £5 shares. All shares taken up. £50,000 considered as paid. Mortgages and charges Nil.

British Empire Lighting and Construction Co., Ltd.—Mortgage dated September 26th, 1913, to secure £700, charged on gas works, mains, meters, plant, &c., at Swinehead, Lincs., and goodwill of the said gas works. Holder: M. J. Johnson, Swinehead, near Boston, Lincs.

Nairobi Electric Power and Lighting Co., Ltd.—Particulars of £3,000 debs., created September 10th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £19,000. Property charged: The company's undertaking and assets, present and future, except a certain contract. No trustees. A memorandum of satisfaction in full on September 10th, 1913, of debs. of various dates from 1908 to 1913, securing £17,000, has also been notified.

Varley Magnet Co., Ltd.—Issue on October 1st, 1913, of £500 debentures, part of a series of which particulars have already been filed.

Reno, Ltd. (117,987).—Return dated September 12th, 1913. Capital, £5,000 in £1 shares (1,000 pref.); 800 pref. and 4,000 ord. shares taken up; £4,800 considered as paid. Mortgages and charges: Nil.

Rural Electricity Supply Co., Ltd. (107,281).—Return dated July 14th, 1913. Capital, £10,000 in 9,500 pref. shares of £1 each and 10,000 defd. shares of 1s. each; 1,856 pref. and 4,713 defd. shares taken up; £1 per share called up on 2,061 pref. and 1s. per share on 4,713 defd.; £2,302 8s. paid, including £112 16s. 3d. paid on 205 shares forfeited; £107 1s. 3d. remains in arrears. Mortgages and charges: £300.

Tubes, Ltd. (91,224)—Return dated July 2nd, 1913. Capital, £100,000 in £1 shares. All shares taken up. £1 per share called up on 82,859. £82,859 paid. £17,141 considered as paid on 17,141. Mortgages and charges: Nil.

Sheerness and District Electric Power and Traction Co., Ltd. (65,749).—Return dated June 30th, 1913. Capital, £75,000 in £10 shares (2,500 pref.). 5,000 ord. and 2,473 pref. shares taken up. £10 per share called up. £74,730 paid. Mortgages and charges: £23,327.

Spensers, Ltd.—Particulars of £3,000 second debentures, created September 5th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £2,000. Property charged: The company's undertaking and property, present and future, including uncalled and unpaid capital. No trustees.

Cleveland and Durham Electric Power, Ltd.—A memorandum of satisfaction in full on October 4th, 1913, of charge contained in an agreement dated May 29th, 1912 (supplemental to an agreement dated January 13th, 1911), securing £31,600, or such other sum as might be payable under the terms of the said agreement of May 29th, 1912, has been filed.

CITY NOTES.

Ferranti, Ltd.

THE directors' report for the year to June 30th, 1913, shows that the profit on trading for the year was £59,599, and, after crediting discounts, interest and transfer fees, and deducting general establishment charges, repairs and renewals, legal expenses, income-tax, bad debts, directors' and trustees' fees, and expenses of issue of five-year notes, there remains a balance of £28,142, which has been applied as follows:—Interest on prior lien debenture, £402; interest on first mortgage debenture stock, £4,850; interest on five-year notes, £1,094; interest on bank loans, £1,799; depreciation reserve account, £10,000; leaving a balance of £9,996; which, together with the amount at credit at June 30th, 1912 (£12,456), makes £22,452. Of this, £22,000 has been carried to the general reserve account, leaving to be carried forward £452. The results for the year again show an improvement over those for the previous year. A further £10,000 has been added to depreciation reserve, increasing the amount to £56,350, and the directors have deemed it advisable to carry £22,000 to the credit of a general reserve account. An issue of 6 per cent. five-year notes has been made, and the balance of the prior lien debentures has been redeemed. By the operation of the sinking fund, £4,000 of the first mortgage debentures have been redeemed, and the loan on second mortgage debentures has been reduced. Mr. S. Z. de Ferranti and Mr. Arthur Whittaker offer themselves for re-election as directors. Mr. R. W. Cooper was elected a director during the year.

The meeting is to be held in London on October 24th.

Auckland Electric Tramways Co., Ltd.

THE annual meeting of this company was held on Thursday last week at the Electrical Federation Offices, Kingsway W.C., Mr. C. C. Tegetmeier presiding.

The CHAIRMAN first expressed the satisfaction felt by his colleagues and himself in being able to present a statement of accounts which showed in such a high degree a continuance of the progress that had characterised the business of the company since the commencement of their undertaking. The traffic receipts last year amounted to £257,591, which was £28,449, or 12 per cent. more than in the preceding year. They had become accustomed to seeing their traffic receipts increase year by year, but although the route mileage worked last year was only slightly in excess of that of the previous year, the result showed a greater proportionate increase than they had ever had in any one year over its immediate predecessor. Dealing with the balance-sheet, the share capital stood at £500,000. During the year they made an issue of £50,000 in preference shares, and those shares were offered to the shareholders at par *pro rata* to their holdings, and with the exception of a very small number, were all taken up. Those which were not taken up were disposed of at a premium. There were also issued during the year £25,000 in debenture stock, and, on the other hand, in accordance with the provision of the trust deed, debenture stock to the amount of £4,487 was redeemed. The renewals and depreciation account at the beginning of the year stood at £71,007. That account was created out of revenue for the purpose of providing for future expenditure upon renewals and reconstruction, as distinct from current expenditure upon repairs and maintenance. As he had stated at previous meetings, the time

was approaching when they would have to meet a considerable expenditure for the reconstruction of the permanent way. Last year extensive renewals and reconstruction were carried out, and the expenditure amounted to £34,844. This had been charged to the renewals account. For the next few years the expenditure would continue heavy, although not, perhaps, to the same extent as last year. They had made arrangements for the purchase of adjoining property which would enable them to enlarge their power station and provide additional plant. They had already placed an order for an additional 1,000-KW. set, which they expected to have installed during the ensuing 12 months. The development of the traffic had also necessitated considerable capital expenditure in doubling the track in several places, and with comparatively slight exceptions, the whole of their track was now doubled. Also they had spent a good deal of money in connection with the new repairing works. From the nature of the capital expenditure to which he had referred, it would be seen that only to a slight extent could it have been directly productive of profit during the year in which it had been spent, and they could look for material benefit from it in the future, not only in increased receipts, but in the greater efficiency of the service and the greater economy in working expenses. In view of future capital requirements they proposed to make an issue of £100,000 ordinary shares. They proposed to adopt the same course with regard to the issue of those shares as they had done on former occasions, and to offer them to the shareholders *pro rata* to their holdings at par, the *pro rata* proportion being one new share to every five old shares. Referring to the revenue account, he said that their total receipts amounted to £261,713, which was £29,362 more than in the preceding year. The continuous growth of their traffic receipts was quite remarkable, and afforded clear evidence of the prosperity which Auckland had been enjoying, and which there was every indication it would continue to enjoy. To carry, as they did last year, 40,000,000 of passengers from a community of the size of Auckland, which was approximately an average of the whole of the population on every day throughout the year, was exceptional, and the upward movement was still continuing. During the first three months of their present year, they had carried more than half-a-million more passengers, and taken over £3,000 more in traffic receipts than in the corresponding three months of last year. The interim dividend on the ordinary shares was paid in May last, and required £10,208: they now proposed a final dividend of 1s. per share, making 1s. 7d. for the year. That would require a further £17,500, and leave £8,782 to be carried forward, as against £8,267 brought in. The reserves they had established with the additions of the carry forward, made a total of £172,444, which was 17 per cent. of the total paid-up shares and debenture capital, including the £100,000 of new capital proposed to be issued. The chairman concluded by moving the adoption of the report and accounts.

Mr. C. Shirreff Hilton seconded the motion, which was carried unanimously.

An extraordinary meeting was subsequently held, and the proposal to increase the capital from £500,000 to £600,000 by the creation of 100,000 new ordinary shares of £1 each, was approved.

Metalite, Ltd.

Mr. W. Stewart presided on Monday at Salisbury House, E.C., over an extraordinary general meeting of the shareholders of the above company, for the purpose of considering a resolution for the voluntary winding up and reconstruction of the company. There was a large attendance of shareholders.

The Chairman said that before commencing to deal with the scheme of reconstruction, which, together with his co-directors, he had had prepared, he very much regretted to have to inform them that on September 21st Mr. Metcalf died, and they had thus lost the valued advice of one who had been the moving spirit during the whole of the company's existence. He was formerly managing director of the company from the date of its formation for some time, and although he afterwards vacated the position, yet he was jointly responsible for the carrying out of the company's trade, and he was the only director who had been connected with the company since its formation. For that reason they had been looking mainly to him to give the meeting a history of the company's work and the details of the present position. He (the chairman) joined the board in July, 1911, and consequently could not say very much of what occurred prior to that time, but he found that all the first directors, with the exception of Mr. Metcalf, had resigned, and that the chief work which then lay before them was to get the work at the Derby factory properly going, and to clear up a number of liabilities which had been accumulating gradually. For that purpose, and also to get further working capital, it was necessary to make a debenture issue which, for the most part, was subscribed by his colleagues and himself, and they also made large cash advances which, he might add, had not been repaid, nor had any of them had any interest thereon. However, matters were progressing fairly satisfactorily. A ready market existed for the company's products, and the only thing required to make the undertaking a success was an increased output, which was gradually increasing week by week, and they had hoped shortly to have turned the corner, when the present trouble was precipitated by the owners of the first mortgage on the company's assets putting in a Receiver in February of this year. This naturally interfered with the uphill task which they were concentrating their efforts upon, and so, during the intervening period, they had been earnestly considering the best steps to take in the company's interest, primarily with a view to helping the shareholders, and incidentally the debenture-holders. As a result of their deliberations they had had a scheme prepared for reconstruction based on a contract, which he would have read to the meeting.

The Secretary pointed out that the document would take a quarter of an hour to read, and it was decided that it should lie on the table and that the secretary should read the scheme as printed in the directors' circular, viz.:—

"The proposed scheme of reconstruction, which, after lengthy deliberations, your directors consider most desirable, is as follows:—

"The proposed new company is to have a nominal capital of £85,000, divided into:

£16,500 being 16,500 £1 profit participating cumulative preference shares bearing prior 7 per cent. dividend and then ranking equally with the ordinary shares for additional dividend.

£21,250 being 85,000 5s. ordinary shares to be issued as fully-paid to the series debenture-holders and loan creditors.

£47,250 being 189,000 5s. ordinary shares to be issued as 3s. 6d. paid up to the existing shareholders in the old company.

Total £85,000

"The existing shareholders will, therefore, have a preferential right to apply for the last-mentioned shares, which will carry an unpaid liability of 1s. 6d. per share, providing a sum of £14,175

Issue of 15,000 7 per cent. cumulative preference shares 15,000

£29,175

"Which will be allocated to:—

First mortgagees' principal interest and costs of receivership (say)	4,500	
Second mortgagees' principal interest and costs (say)	1,350	
Third debenture	2,500	
Preferential and trade creditors and costs of reconstruction (say)	3,000	
Balance of consideration for the exclusive British licence under Boran Patent (No. 9,941, of 1912)	1,000	12,350

Leaving in hand for working capital (estimated) £16,825."

The Chairman said that, personally, he had no doubt if they were prepared to adopt the resolution which he would move, that success would yet come to the company, which was in possession of a factory fully equipped with the most modern machinery and plant requisite for the manufacture of metal filaments and metal-filament lamps, and which had the exclusive British licence to manufacture and sell the Boran lamp. As regarded the management, that was entirely in their hands, as the directors of the new company would have to be elected by the shareholders—as to two directors by the preference shareholders, one director by the fully-paid shareholders, and two directors by the partly-paid shareholders. He should like to say a few words with reference to the vendors' outstanding calls. As they would remember, the vendor companies—the Bryant Trading Syndicate and the International Filaments, Ltd., paid for somewhere about 120,000 shares. Of these they had gradually placed a large number, and on these the whole of the calls had been paid. In addition, the vending companies had paid further amounts, and actually there were now outstanding only about one-third of the original liability. Although they had repeatedly pressed for the payment of the balance, the vendor companies found they were unable to pay off the sum at present, and, so far as the directors could see, were not likely to be in a position to do so, at any rate for some considerable time. Under those circumstances, it seemed grossly unfair that the company should retain the benefit of voting at that meeting, and for the large vote which they held in virtue of their fully-paid shares which they held as distinct from the shares with unpaid calls, prevent the passing of the resolution, and thus deprive the other shareholders of the benefits which would accrue to them under the scheme. Seeing that it was hopeless to endeavour to collect the calls, the directors made the proposition to the vendor companies, and it had been agreed that, in consideration of the vendor companies refraining from voting at the meeting, they should be released from their liability, which, after all, so far as their company was concerned, really made no tangible difference. He moved:—

That it is desirable to reconstruct the company and accordingly that the company be wound up voluntarily, and that Gordon Stuart Clarke, of 10, Pancras Lane, in the City of London, be and he is hereby appointed liquidator for the purposes of such winding up, and that the draft agreement submitted to this meeting and expressed to be made between this company and its liquidator of the first part, the London City and Midland Bank of the second part, Herbert Samuel Golding and James McDougall of the third part, William Plato Oulton of the fourth part, R. C. J. Goodrich of the fifth part, Bryant Trading Syndicate, Ltd., of the sixth part, International Filaments, Ltd., of the seventh part, the Derby Lamp Works, Ltd., of the eighth part, and the same is hereby approved, and the said liquidator be and he is hereby authorised pursuant to Sec. 192 of the Companies' (Consolidation) Act, 1908, to enter into an agreement with the said Derby Lamp Works, Ltd. (when incorporated), in the terms of the said draft and to carry the same into effect.

Mr. Bentley, in seconding the motion, said the chairman told them he joined the board in 1911. He (the speaker) was asked to join the board in 1912, and since joining the board, he might say it had been one continual drain on his resources. He had put upwards of £8,000 into the company's trading, and therefore they would quite appreciate that to him it was essential that the company, if possible, should be floated into a prosperous condition. The matter was entirely in the shareholders' hands. They, as directors, courted the fullest publicity. During the 18 months that he had been connected with the company he had paid all his own expenses coming up to the board meetings. He had continually put his

hand into his pocket, and up to the present had not received £1 out of the company. That was the position in which he stood, and so he thought he was as great a sufferer as anyone there.

Mr. Porch asked who Mr. Clarke, the liquidator, was, and if he were a chartered accountant.

The Chairman said he was not a chartered accountant, but was a qualified accountant.

Mr. Porch moved as an amendment that Mr. Gosling, chartered accountant, be appointed liquidator. He said he understood Mr. Clarke was only a clerk.

Mr. Gilbert seconded the amendment.

A Shareholder pointed out that there were two sides to the question. His experience was that if they got into the hands of a chartered accountant, it was a costly matter. In this case they had a young man prepared to come in and, under the guidance of the board, liquidate the company.

Another Shareholder pointed out that they were losing sight of the material point. It was not a question of the liquidation, but of the scheme. It seemed that the directors had put a large amount of money into the company, and if the shareholders were going to squabble over the scheme, they were going to throw their money away.

Mr. Porch said he would seriously suggest that it would be far better for the directors to have an independent liquidator.

The Chairman said that in anything Mr. Clarke would do, he would be properly supervised by the directors.

The amendment was then put to the meeting, and defeated.

A Shareholder asked what was the position of the shareholders who did not wish to continue in the new company?

The Chairman said that would be dealt with by the liquidator in the usual way.

A Shareholder pointed out that there was a well-defined course under which shareholders were dealt with under a reconstruction scheme. It was carried out in a very simple manner.

Mr. Odell asked what was the minimum amount of subscribed capital on which the board would go on?

The Chairman: That will be absolutely at the discretion of the new company.

Mr. Odell: It seems to me everything is put at the discretion of the liquidator.

The Secretary said it would be at the discretion of the directors of the new company. The directors were to be nominated in a certain way as stated by the chairman.

Mr. Odell asked if it was not possible that some of them would pay up the further call, and then find the whole thing fizzle out, and no more be heard of it?

The Secretary said of course a prospectus would be prepared and issued in the usual way, and the shareholders would apply for new shares on the basis of that. That would set out everything provided for under the Companies Act.

Mr. Odell said they knew the metal lamp never had a chance. They had heard talk of grave irregularities, and they knew they had never had enough capital. If the Bryant Syndicate and the International Filaments, Ltd., paid up what they owed, there would be a chance.

Mr. Raphael asked if that was not a question of being wise after the event. If the directors had known what they knew now, probably they would not be in the position in which they now found themselves. He did not think it was a matter about which the meeting should concern itself.

Mr. Odell said he thought it was. The directors knew perfectly well that they never had enough money to make the thing a success.

Mr. Raphael: That is passing a vote of censure on the directors.

Mr. Odell said that at a meeting at Derby two shareholders made themselves very nasty and threatened proceedings against the board. He had reason to suppose that arrangements were made with these gentlemen afterwards to withdraw the proceedings, and he would like to know if he was right. Were any proceedings pending, or had any proceedings been taken and withdrawn?

The Chairman: No action whatever has taken place.

Mr. Odell: Was any settlement made with Mr. Rossendalt?

The Secretary: No.

The Chairman: You raised the point at a meeting, and I gave you an emphatic denial. No arrangement has been made with him.

A Shareholder asked if the Boran lamp had been proved or was it only an experimental lamp.

The Chairman said he believed the Boran lamp had passed the stage of experiment. It was an accomplished fact.

The Shareholder: Has it been placed on the market?

The Chairman said the factory had been closed since February 5th, and no lamps had been made.

Another Shareholder asked if the new company was being floated simply to exonerate the directors from all blame or liability, or whatever they liked to call it, or was it simply with the idea that everything would be better when the company was formed?

Mr. Bentley said the new company was being formed simply because the old company had no capital and could not carry on the business. They had a factory up to date in every respect at Derby, and an extensive market, but no money.

The Shareholder: Then sell it.

Mr. Bentley said if the resolution was passed the matter would be in the hands of the new directors; they could either sell or carry on the business, but until the resolution was carried nothing could be done, because everything was at a standstill for lack of capital.

A Shareholder said he wanted to know whether there was any liability attaching to the present directors if the new company was formed.

Mr. Raphael said that if the directors had done anything for which they were amenable they did not get rid of their liability by the course which they suggested should be adopted now. The new company would have the right to inquire into the whole action of the old company, and if the directors had done any wrong they must pay the usual penalty for it. It occurred to him that the only possible method of getting anything out of the assets of the company was by the meeting adopting the resolution. The directors of the new company would be the persons who would have the direction of the liquidator. The liquidator would be merely the conduit pipe for the purpose of transferring the assets of the company to the new company. The only hope of getting anything out of the company was by the reconstruction scheme. He was not in a position to state it definitely, but he had been told that negotiations were on foot with the debenture-holders of the company for the purpose of their surrendering their debentures with a view to taking shares in a new concern. If that were so it would be very materially to the benefit of the shareholders, and therefore he thought their time would be better served by passing the resolution and getting to business as soon as they could.

At this stage a Shareholder asked that the contract document should be read, and the secretary accordingly read it.

Mr. Odell asked if any actual cash had been paid to the company by the Bryant Trading Syndicate and the International Filaments, Ltd., during the last 18 months, and, if so, how much.

The Chairman said Mr. Odell knew there was an action for winding up. He did not remember the date of the action.

Mr. Odell said it was 12 months ago.

The Chairman said he thought that killed the goose absolutely, a proceeding in which Mr. Odell took a considerable part.

Mr. Odell said that he did, and he thought that had it been successful they might have got something. He would propose as an amendment that the company be wound up compulsorily. He thought if they did that the Receiver would press the vendor companies. They simply wanted the money owing by those concerns, and then they could go ahead.

The amendment was seconded, but the chairman said he could not accept it.

A lady Shareholder said that in April, 1912, she received a letter in which it was stated:—"The company, apart from the present business, will this year show gigantic strides, and shareholders will consult their own interests in refusing to sell their holdings at less than par, there being every possibility that the shares will be readily marketable at a substantial premium."

The Secretary: Who is that signed by?

The lady Shareholder said it was signed by a person named Nunn. She and her sister-in-law held 600 shares bought with their hard-earned savings. They had that letter, which made them feel very pleased, and now they were going to lose all.

Another Shareholder said that in March last he received a letter from Wood Green asking him to sell his shares.

Mr. Raphael said such circulars were being constantly sent out by those who were trying to make a market in shares. It was a practice which everyone in the City knew extremely well. He understood that the company was in no way responsible for the circulars.

Several Shareholders asked what the position would be of the shareholders who did not come in.

Mr. Raphael said that what the scheme meant was that they were going to cut down their capital to a large extent, and shareholders were at liberty to take up shares of the value of 5s., on which 3s. 6d. would be paid. If they did not choose to pay up the 1s. 6d., then their shares were put on one side and sold for what they would fetch. The last paragraph in the circular showed how the directors were to be elected.

The resolution was then carried by 25 votes to 4.

Hurst, Nelson & Co., Ltd.—The directors' report shows, after deduction of all charges, a gross profit of £61,057. After deducting income-tax and interest, depreciation and balance of formation expenses, the directors recommend payment of arrears of dividend on preference at the rate of 6 per cent. per annum for the year ended May 15th, 1913, less tax, £11,300; dividend at rate of 6 per cent. on preference from May 15th to November 11th, 1913, less tax, £5,650; to reserve an equal amount to provide for payment of a half-year's dividend on May 15th next, £5,650; to special reserve fund for security of dividend on preference share capital, £10,000; in payment on November 11th, 1913, of dividend on ordinary at rate of 5s. per share, free of tax, £3,000; leaving to be carried forward £2,257.—*Financial News.*

Prospectus.—*Newcastle-upon-Tyne Electric Supply Co., Ltd.*—The list was to close on Tuesday in an issue of £400,000 5 per cent. second mortgage debenture stock. The proceeds will be utilised in repaying the company's floating indebtedness, in meeting the expenditure in respect of the extensions of the Dunston generating station, for prospective developments and extensions, and for other purposes.

Oriental Telephone and Electric Co., Ltd.—Interim dividends are announced of 3 per cent. on the 6 per cent. cumulative preference shares for the current year, less income-tax, and 4 per cent. on the ordinary shares, free of income-tax. Warrants will be posted on 31st inst.

Continental.—Germany.—The Rheydt Kabelfabrik Gesellschaft, of Rheydt, reports a net profit of £84,911 for the last financial year, as against only £60,158 in the preceding 12 months. The dividend is being increased from 8 to 12 per cent.

Dick, Kerr & Co., Ltd.

The annual meeting was held on Thursday, October 9th, at the Cannon Street Hotel, E.C., under the chairmanship of Mr. C. T. Cayley.

In moving the adoption of the report (see Elec. Rev., p. 550), the Chairman said he was glad to be able that year to meet the shareholders with a better showing of results than was the case last year, although, perhaps, it went without saying that they were not yet in the position in which they would all like to be. He made no prophecy last year, and preferred not to do so now. In a business such as theirs with interests in many varied branches and all over the world, he would be a bold man who predicted results in advance, especially in view of the labour, financial and political complications existing at the present time. In the balance-sheet they would have found some charges. They would see that the item of "capital expenditure" at the works, including "goodwill and patents," showed a reduction of over £7,000, which represented the amount by which the depreciation exceeded the additional capital expenditure for the year. No doubt they would regard this as a satisfactory feature in the accounts, and he might say that, although they had been obliged to face a considerable diminution in their profits in recent times, the directors had consistently adhered to what they believed to be a sound and conservative policy in regard to depreciation at the works. Then the "stocks in hand and work in progress," which referred only to the manufacturing side of the business, showed an increase of £31,000 over last year. This was the high watermark on this account in the history of the company, and although it locked up more of their capital from a financial point of view, it might be regarded as a favourable sign in other respects. Taking the "Debtors' bills receivable," and the outstanding balances on contracts together, they found that these assets had increased to the extent of £71,753 as compared with last year. The only other assets calling for explanation were "Sundry investments," which were nearly £28,000 less than last year. This was accounted for by the sale of certain securities, and by the writing down of the book value of the investments by the amount of the special reserve of £16,000, as explained in the report. This reduction was also to a large extent set off by the increase in the amount of cash balances. Turning to the liabilities side of the balance-sheet, the only change of importance was the "Loan from bankers £100,000." In order to arrive at an explanation they must, first of all, look at the other floating liabilities, and they would see that the creditors, bills payable and loans (other than banker's loans) showed an increase of about £12,500 on last year, as against the increase of £71,753 which he had already alluded to in the corresponding assets on the other side, viz., debtors, bills receivable and contract balances. There was, therefore, a net increase of assets over liabilities on these accounts of nearly £60,000, and then they had to take into consideration the increase in the value of stocks and work in progress, viz., £31,000. There were, of course, other fluctuations, such as the reduction in the amount of the debenture stock, which were being gradually redeemed, but he thought they would see that the banker's loan was accounted for by the increase in the amount of capital they had been called upon to provide in the shape of increased stocks and increased debtors. The demand for extra working capital was the result of expansion in their manufacturing branches. He knew of no branch of the heavy engineering trades in which the custom in respect to payments was so severe. To begin with, progress through the shops averaged at least 12 months, and in addition they had often from two to three months expended in shipment to destination, and the custom of the trade was that the first payment was made upon delivery at destination. They were endeavouring with some success to get a modification of this and other onerous conditions.

Mr. R. H. Prestwich seconded the motion.

Mr. J. B. Concannon congratulated the board on the progress made during the year, and he thought some stress might be laid on the statement of the auditors as to the ample depreciation which had been made with respect to the plant and machinery.

Mr. A. L. Ashwell pointed out that whilst they had been told there was more work in hand they had not had any indication as to when they might expect a dividend.

The Chairman, in reply, said nearly a half of the ordinary stock was held by the directors, and they naturally regretted that there was no dividend. The profits had been increased by hard work to nearly £30,000 that year, and if the ordinary shareholders would exercise patience the board hoped that some day they would pay a dividend.

The report was adopted.

In replying to a vote of thanks, the Chairman mentioned that it was very doubtful if the company would be able to do a great deal of business with the United States, as the American tariff was still something like 30 per cent. against them.

Anglo-American Telegraph Co., Ltd.—The directors have declared an interim dividend for the quarter ended September 30th, 1913, of 15s. per cent. on the ordinary stock and £1 10s. per cent. on the preferred stock, less income-tax, payable on November 1st.

Direct United States Cable Co., Ltd.—Interim dividend, 2s. per share, less income-tax, payable on and after the 31st inst., making a total distribution of 4 per cent. for the half-year ended September 30th.

Zurich Bank for Electrical Enterprises.

The general survey which is usually given in the annual reports of the Bank für Elektrische Unternehmungen, which is an investment and underwriting company, is very brief for the year 1912-13. After referring to the wars in Tripoli and in the Balkans, which caused great reserve to be shown in business, the report states that the increased dearness of money was also reflected in the large decline in the share quotations of electrical undertakings. The constantly growing use of electricity for lighting and trade purposes brought about an almost general advance in revenue and the surpluses realised by the enterprises associated with the bank were higher in most cases than those in the preceding year. Apart from individual branches, the manufacturing trades scarcely experienced any ill-effects from the disturbed political conditions, and in certain countries an improvement took place. It cannot at present be foreseen whether these favourable circumstances will continue. During the year the share capital of the bank was raised by the issue of £600,000 in new shares at the price of 150 per cent., the premium realised being devoted to the reserve funds and to depreciation, particularly in the case of new investments. The accounts show the following results for the two years:—

	1912-13.	1911-12.
Share capital	£3,000,000	£2,400,000
Loan capital	2,630,000	2,660,000
Gross receipts	461,000	411,000
Net profits and balance forward ...	283,000	258,000
Dividend	270,000	240,000
„ per cent.	10	10

The value of the shares held, and of advances made on current account, have largely increased during the year, but the payments on underwriting transactions slightly declined, as compared with 1911-12. A detailed list of the securities is given, and it is mentioned that in order to prevent future surprises, owing to possible fluctuations in the quotations, all the share investments are entered in the balance-sheet at the nominal value or less. The report also enumerates the new investments made in 1912-13, and the underwriting transactions, including the formation of a special company for the carrying out of the concession for a high level and underground railway between Stamboul and Pera, Constantinople.

Quebec Railway, Light, Heat and Power Co., Ltd.—At the annual meeting held in Montreal on September 9th, the directors reported that for the fiscal year ended June 30th, 1913, the gross earnings from operation were $1,524,200, as compared with $1,415,825 in 1912, an increase of $108,375. After adding miscellaneous income of $236,881, the total revenue from all sources was $1,761,082, an increase of $150,672. The operating and maintenance expenses were $895,180, against $734,925, an increase of $160,255. The fixed charges and taxes of all kinds amounted to $792,100, leaving a net surplus of $73,801, which, added to that of last year, leaves a total surplus to date of $147,341. The sum of $27,641 was received from the Dominion of Canada on account of subsidies. This sum has been applied to the cancellation of $30,000 bonds according to the trust agreements. The properties and plants of the company and its various subsidiary companies have been maintained in the same high state of efficiency as heretofore, as evidence of which there was expended during the year on maintenance account, $91,500.

Cleveland and Durham Electric Power, Ltd.—The directors' report for the year ended June 30th, 1913, states that during the year the capital expenditure on works has amounted to £12,396. The gross profit amounts to £33,225, as compared with £25,784 for the previous year, an improvement of £7,440. After providing for debenture and other interest, there remains a net profit of £14,225 (as compared with £6,720 last year), which, together with £3,589 brought forward, gives an available balance of £17,814. The directors propose payment of a dividend of 4 per cent. on the preference shares (£13,348), transferring to depreciation and renewals account £2,000, and carrying forward £2,466. The connections to the system at June 30th, 1913, aggregated 55,133 H.P., an increase of 6,704 H.P. connected during the year. A further 15,000 H.P. has been arranged for.—*Financial Times.*

Argentina.—The Argentine Railway Co. having obtained control of the Hydro-Electric Co., of Tucuman, by the purchase of 8,000 shares of $100 gold each, have taken over the management of the company. The board of directors which hitherto existed in Buenos Ayres having resigned, Mr. R. Stuart has been appointed interventor of the company in Tucuman.—*Review of the River Plate.*

Cuba Submarine Telegraph Co.—An interim dividend for the six months ended June 30th at the rate of 6 per cent. per annum, free of tax, on the ordinary shares is announced.

Anglo-Argentine Tramways Co., Ltd.—The directors have declared an interim dividend of 4 per cent., less income-tax, on the ordinary shares for the half-year ended June 30th last.

Humphrey Pump Co., Ltd.—The statutory meeting of this company was held on October 9th, Mr. E. Mond presiding.

German Electrical Companies.

The directors of the *Kabelwerk Rheydt A.G. of Rheydt*, after making ample provision for depreciation, recommend the payment of a dividend of 12 per cent. for 1912-13, this comparing with 8 per cent. in the preceding year.

The *Brandenburg Carbid und Elektrizitätswerke A.G., of Berlin*, reports that a further favourable development took place in 1912-13, both in regard to the production of carbide and the supply of electrical energy; and the gross profits rose from £19,000 in 1911-12 to £23,000 last year. After making provision for depreciation the net profits are returned at £10,000, as compared with £7,900. It is proposed to pay a dividend of 5 per cent., as against 4 per cent. in 1911-12.

The *Elektrizitäts A.G. (late H. Poge), of Chemnitz*, reports that business was very active throughout the year 1912-13 and the works were fully employed. As gross profits the accounts show the sum of £105,000, as contrasted with £59,000 in 1911-12, the turnover having increased by £450,000. After meeting general expenses, &c., and placing £19,000 to depreciation as against £15,000, there remain net profits of £15,900, as compared with £15,600. A dividend of 7½ per cent. has been declared, this being the same rate as in 1911-12.

The report of the *Deutsche Gluhlampen Fabrik A.G., of Plauen*, states that in consequence of changes in the workmen, the high prices of raw materials, and the depression in prices caused by large competitors, the sale prices of the company's glow lamps in 1912-13 declined below the cost of production. The loss of £19,000 reported a year ago had considerably increased, and in January, 1913, the share capital was reduced in order to cover the loss and provide further funds, the latter being augmented by the advance of £10,000 by a group of shareholders. The future prospects are regarded favourably as a larger stock of orders is on hand, although further working capital has now to be raised.

The *Wolfram Lampen A.G., of Augsburg*, earned gross profits of £130,000 in 1912-13, as compared with £89,000 in the previous year, and the net profits amounted to £7,900, as against a loss of £26,000 in 1911-12. As a result of this loss the share capital was reduced from £150,000 to £30,000 in the past year, the book profit thereby realised being applied to the extinction of the deficit and to writing down the value of plant, machinery and patents. At the same time an issue of £30,000 in preference shares were made, and a total of £23,000 was subscribed. It is now intended to pay a dividend of 6 per cent. on the preference shares, leaving £6,200 to be carried forward.

The *Oerlikon Co.*—The report of the Maschinenfabrik Oerlikon, of Zurich, states that the department for general electrical machinery and transformers was fully employed during the whole of 1912-13, and the apparatus department was also exceptionally well occupied, both for individual apparatus and for complete switchboard installations. The special drives for the textile industry continued to enjoy great favour, and in the department for lifting plant and electro-mechanical plant, the record turnover effected in 1911-12 was considerably surpassed in the past year, whilst a larger volume of business was also transacted in turbine machinery. In the electric railway branch the year was one of great development, both in respect of the carrying out of the work which was commenced in 1911-12, and in relation to new orders. The business in shunting and workshop locomotives experienced a large expansion. During the year the company delivered the locomotives for the Engadine line of the Rhatian railway and the locomotives for the Lotschberg line of the Berne Alpine Railway Co. The sales companies abroad, in which the company is interested, yielded satisfactory results with one exception, which incurred a loss in consequence of a failure. An understanding had been reached with the Société Suisse d'Entreprises Techniques of Constantinople, whereby this company undertakes to represent the Zurich firm. The accounts show net profits of £43,000 for 1912-13, as compared with £21,000 in the previous year, and a dividend of 7 per cent. has been declared on the ordinary share capital of £320,000, this rate contrasting with 5 per cent. in 1911-12.

Argentina.—The annual general meeting of shareholders of the Compania Tramways Eléctricos del Sud was held on the 11th ult., when the report and balance-sheet to June 30th were approved. Profits amounted to $202,979.56, out of which the shareholders received a dividend of 6 per cent.—*Review of the River Plate.*

Mexico Tramways Co.—The directors have declared a dividend of 1¾ per cent. on the issued capital stock.

STOCKS AND SHARES.

Tuesday Evening.

Many people expect to see a rise in the Bank Rate at the end of this week, and the possibility of a 6 per cent. minimum before Christmas is canvassed with a good deal of interest. The pessimist says: "Why not take the bull by the horns, and discuss the chances of an 8 per cent. Bank Rate?" But more sober-minded men declare even now that, with a moderate amount of good luck, the Bank may be able to keep the money market steady on a 5 per cent. basis for the rest of the twelvemonth.

This dearness of money is the prevailing factor in Stock Exchange markets for the time being. It had the effect of depressing prices during the arrangement of the carry-over on Monday; it has the further negative effect of causing people to put money on deposit with their bankers, instead of using it for investment in Stock Exchange channels. Other disquieting considerations are the unsettlement in Brazil and the *coup d'état* in Mexico, both of which have played their parts in putting down prices in some of the markets with which we deal.

The dreadful experience of the *Volturno* shows once more how invaluable is wireless telegraphy when a disaster happens at sea, but this time there was no such result in the Marconi market as followed the tragedy of the *Titanic*.

The Central London non-assented stocks have fallen heavily, the drop amounting to as much as 10½ points in the case of the Ordinary, 5½ in the Preferred, and 13½ in the Deferred. The assented stocks have given way a little. The slump in the non-assented issues is due to the partial approximation of the stocks to the same level as the assented, with reference to the yield. It was, of course, absurd that the Deferred, which received 2 per cent. last year, should be standing at a price at which the return worked out at £2 12s. on the money, while on the Deferred-assented the yield came to £4 18s. 9d.; and that there was certain to be some sort of adjustment of values in this direction has been clear for some time past. The only wonder is that it did not happen months ago, and that it has not been carried further.

Metropolitans fell 1½ and Districts 1, thanks to the stiffness of money and to the emphatic refusal of the public to take any interest in the Home Railway stocks for the time being. The carry-over charges on Underground Electrics were rather lighter than those on other Home Rails, but this did not prevent a fall of a point in the company's 6 per cent. Income bonds, which have eased off to 90 sellers.

The English Electricity Supply group moves irregularly. City of London Ordinary shares at 16¼ are ¾ down, but the Preference have risen 5s. to 12¾. The drop in the Ordinary came about as the result of the general depression in other markets, which caused some of the holders to get out of their "City Lights" in sheer disgust with the outlook for all the markets. County Preferences hardened with Cities, but Westminster Preference fell ⅛, and the Company's Ordinary shares are weak at 8⅝, being a fall of 7s. 6d. It will be noticed that the yield on Westminsters at the present price comes to £5 12s. 8d. per cent.

Vancouver Power new 4½ per cent. Debenture stock was left in the hands of underwriters to the tune of 70 per cent. The price dropped to 3 discount, rallying to 2 discount. This means about 86 for the fully-paid scrip. The security, as set forth in the prospectus, is excellent.

The extraordinary events in Mexico at the end of last week took everybody by surprise, and most of the securities connected with the country felt the shock. Railway descriptions suffered most, but there are falls in the Common shares and bonds of the Mexico Tramways and the Mexican Light and Power Companies. The market naturally tends to become more and more restricted, but it can be confidently relied upon that the buyer will not find it difficult to get hold of stock. The Mexico Tramways Company has declared its usual dividend of 7 per cent. per annum; this did not, however, save its securities from fresh declines.

Brazilian Tractions slumped at one time to 88, but have recovered to 90, leaving them with a fall of 2 points on the week. Nearly everything connected with Brazil is depressed, from Brazilian Government bonds downwards. The flatness has extended to Rio Tramways and Sao Paulo Tramways bonds, the falls in which range from 1½ to 4½ points, the latter drop occurring in Rio Second Mortgage bonds. This state of affairs has been brought about, as noticed before, by the fears regarding the rubber industry and the condition of Brazil generally. The Minister of Finance has drawn attention to the necessity for retrenchment, but, on the other hand, the coffee crop is seeking to make up some of the falling-off caused to the revenue by the rubber crisis, the upshot of which nobody is able to forecast with any degree of accuracy.

Plantation rubber shares are in a bad case, benefiting nothing from the difficulties of the Brazilian producers, while all the panaceas which are put forward for the protection of the industry in the Middle East prove powerless to prevent prices from slipping back. It is to be observed that the fall in the price of rubber appears to have done the larger consumers little good, with the exception of the man who buys motor tires. The companies which are interested as consumers of rubber are unchanged so far as their prices are concerned. In the list of Manufacturing shares quoted overleaf, the only changes are a fall of $\frac{1}{16}$ in Babcock & Wilcox, and a rise of $\frac{1}{32}$ in British Aluminium, neither of which can be attributed in any way to the vagaries of rubber. Shawinigan Water has been flat, shedding 3½ points; and Electric Light and Power of Cochabamba at 91½ is 2½ down. Calcutta Electric Ordinary hardened to 7½, this being one of the few rises that have taken place during the present week.

The Telegraph market is dull, like the rest. Various falls have occurred in the cable companies' stocks, the decline extending to Debenture and pre-Ordinary issues. The Direct United States Cable Company has declared a second interim dividend of 2s. per share, making 4 per cent. in respect of the half-year; the shares remain steady at 6¾. Anglo-American Telegraph eased off after its recent firmness. American Telephone and Telegraph Convertible bonds fell a point to 102, while the 4½ per cent. issue shed 6 on Tuesday, which took back the price to 100½. Orientals are better. The preliminary opening of the Panama Canal has had no effect upon prices, not even West India and Panama shares responding to the mighty upheaval brought about by President Wilson's touching a button at Washington.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations Oct. 14th.	Rise + or Fall —	Present Yield p.c.
	*	1912.	1919.			£ s. d.
Bournemouth & Poole, Ord.	10	6	5†	9½ — 10½	..	5 17 1
Do. 4½ % Pref.	10	4½	4½	8⅝ — 9⅛	..	4 14 9
Do. Second 6 % Pref.	10	6	6	10 — 10½	..	5 14 3
Do. 4½ % Deb. Stock	Stock	4½	4½	95 — 98	..	4 11 10
Brompton & Kensington, Ord.	5	10	9†	8¾ — 9	..	5 11 1
Do. 7 % Cum. Pref.	5	7	7	8¼ — 8⅝	..	4 1 2
Central Electric Supply, 4 % Guar. Deb.	100	4	4	94 — 97	..	4 2 6
Charing Cross, West End & City	5	5	5†	4½ — 5	..	5 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝	..	4 17 3
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3¾ — 4	..	5 12 6
Do. Do. 4 % Deb.	100	4	4	90 — 92	..	4 7 0
Chelsea, Ord.	5	5	4†	4½ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	94 — 97	..	4 12 9
City of London, Ord.	10	9	6†	15⅝ — 16½	— ⅜	5 7 6
Do. 6 % Cum. Pref.	10	6	6	19½ — 18½	+ ½	4 10 7
Do. 5 % Deb.	Stock	5	5	115 — 119	+1	4 4 0
Do. 4½ % Second Deb.	100	4½	4½	99 — 101	..	4 9 1
County of London, Ord.	10	6	5†	11⅜ — 12½	..	4 18 0
Do. 6 % Pref.	10	6	6	11⅜ — 12⅝	+ ⅛	4 19 0
Do. 4½ % Deb.	Stock	4½	4½	102½ — 104½	— ½	4 6 2
Do. 4½ % Second Deb.	Stock	4½	4½	98 — 101	..	4 9 1
Edmundson's, Ord.	£3	..	..	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref.	5	6	6	4 — 4⅜	..	3 8 7
Do. 6% Non-Cum. Pref.	5	..	..	1⅝ — 2	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	80 — 83	..	5 8 5
Folkestone	5	6	6	4⅜ — 4⅞ xd	..	6 3 1
Do. 5 % Cum. Pref.	5	5	5	4⅜ — 4⅝ xd	..	5 2 7
Do. 4½ % First Deb.	100	4½	4½	89 — 91	..	4 19 0
Hove	5	9	..	7⅞ — 8¼	..	5 9 1

NAME.	Stock or Share.	Dividends for		Closing Quotations Oct. 14th.	Rise + or Fall —	Present Yield p.c.
	*	1912.	1913.			£ s. d.
Kensington & Knightsbridge, Ord	5	8	8†	7½ — 8	..	5 0 0
Do. 4 % Deb.	Stock	4	4	88 — 91	..	4 7 11
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	74 — 78	..	5 15 5
London Electric, Ord.	3	2½	..	1⅛ — 1⅜	..	4 12 7
Do. 6 % Pref.	5	6	6	4⅝ — 5⅛	..	5 17 1
Do. 4 % First Mort. Deb.	Stock	4	4	90 — 93	+1	4 6 0
Metropolitan	5	4	4†	3⅜ — 3⅞	..	5 3 3
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4¼	..	5 0 0
Do. 4½ % First Mort. Deb.	Stock	4½	4½	96 — 99	..	4 10 1
Do. 3½ % Mort. Deb.	Stock	3½	3½	79 — 82	..	4 5 4
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98 —101	..	4 19 0
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	10 — 10⅜	..	5 11 7
Oxford	5	7	6†	5⅞ — 6⅛	..	5 9 10
St. James' and Pall Mall, Ord.	5	10	10†	9 — 9½	..	5 5 3
Do. 7 % Pref.	5	7	7	6¾ — 7	..	5 0 0
Do. 3½ % Deb.	100	3½	3½	82½ — 85½	..	4 1 10
South London, Ord.	4	5½	..	2⅞ — 3⅛	..	7 0 9
Do. 5 % First Mort. Deb.	100	5	5	96 — 99	..	5 1 0
South Metropolitan, 7 % Pref.	1	7	7	1⅛ — 1⅜	..	6 1 3
Do. 4½ % First Deb. Stock	100	4½	4½	93 — 96 xd	—1	4 13 9
Urban, Ord.	£3	Nil	..	⅛ — ¼	..	..
Do. 6 % Cum. Pref.	5	3	..	2⅛ — 2⅝	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86 xd	..	5 4 8
Westminster, Ord.	5	10	10†	£⅜ — 8½	— ⅜	5 12 8
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — £⅛	— ⅛	4 7 10

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6†	4⅞ — 5⅛	..	5 17 1
Calcutta, Ord.	5	8½	..	7½ — 7⅝	+ ⅛	5 9 8
Do. 5 % Pref.	5	5	5	4⅜ — 5⅛	..	4 17 6
Calgary Power, 1st Mort. Bds.	100	5	5	91 — 93	..	5 7 6
Canadian Gen. El. Com.	$100	7	7†	110 —115	..	6 1 9
Do. 7 % Pref.	$100	7	7	117 — 122 xd	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	5	..	⅞ — 1⅛	..	6 3 1
Do. 5 % Deb.	100	5	5	91 — 93 xd	..	5 7 6
Elec. Lt. and P. of Cochabamba, 5 % Bonds	100	6	6	90½ — 92½	— 2½	6 9 9
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	87½ — 90½	..	5 10 6
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	92 — 94	..	5 6 5
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	3/32 — 5/32	..	Nil
Do. 6 % Pref.	1	6	..	7/8 — 15/16	..	10 13 4
Kaministiquia Power, 5 % G. Bs.	$500	5	5	102 —104	..	4 16 2
Madras, Ord.	5	Nil	..	1½ — 1⅞	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	103 —106	..	4 14 4
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	77 — 81	..	6 3 5
Mexican Lt. & Power, Common	$100	4	4	60 — 65	—2½	6 3 1
Do. 7 % Cum. Pref.	$100	7	7	94 — 99	—1	7 1 5
Do. 5 % 1st Mort. Gold Bds.	..	5	5	87½ — 90½	—2½	5 10 6
Do. 5 % 2nd Mort. Bonds	100	5	5	74 — 78	—3	6 8 2
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	73 — 76	..	6 11 7
Montreal, Lt., H. and Power	$100	9	10†	217 —227	..	4 8 1
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5a	5a	15 — 25	..	..
River Plate, Ord.	Stock	10	..	207 —217	..	4 8 0
Do. 6 % Non-Cum. Pref.	Do.	6	6	102 —107	..	5 9 1
Do. 5 % Deb. Stock	Do.	5	5	97½ — 99½	..	4 19 6
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101 xd	..	4 9 4
Shawinigan Water, Capital	$100	5½	6†	135 —139	—3½	4 6 4
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	105 —107	..	4 13 6
Do. 4½ % Per. Deb.	Stock	4½	4½	100¼ — 102½	..	4 7 10
Toronto Power, 4½ % Deb.	Do.	4½	4½	97 —100	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	90½ — 92½	..	5 8 1
Victoria Falls Power, Pref.	1	6	6	13/16 — 15/16	..	6 8 0
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 —105	..	5 14 3

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4½	..	6⅞ — 7⅛	..	6 2 0
Do. 5 % Deb. Red.	Stock	5	5	95 — 97	..	5 3 1
American Telep. & Teleg., Cap.	$100	8	8	126 —128 xd	—¼	6 5 0
Do. Collat. Trust	$1000	4	4	92 — 94	..	4 5 1
Anglo-American Telegraph	Stock	8	3	62 — 65	..	4 12 4
Do. 6 % Pref.	Do.	6	6	105½ —106½	— ½	5 12 8
Do. Def.	Do.	30/-	..	23½ — 23⅝	..	6 6 4
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	8	..	7⅝ — 7⅞	..	5 5 7
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	80 — 82	—1½	4 17 7
Cuba Telegraph	10	6	6†	8½ — 9½	..	6 9 9
Do. 10 % Pref.	10	10	10	14½ — 15½	..	6 9 0
Direct Spanish Telegraph, Ord.	5	4	4	8½ — 8¾ xd	..	5 6 8
Do. 10 % Cum. Pref.	5	10	..	6½ — 7½ xd	..	6 13 0
Direct United States Cable	10	4	4†	6⅝ — 7⅛	..	5 12 3
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7	128½ —131½	..	5 6 5
Do. 3½ % Pref. Stock	Do.	3½	3½	75½ — 77½	..	4 10 4
Do. 4 % Mort. Deb.	Do.	4	4	96½ — 98½	— ½	4 1 3
Eastern Extension	10	7	7	12⅝ — 13	..	5 7 8
Do. 4 % Deb.	Stock	4	4	94 — 96	—1	4 3 4
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	99½ —101½	..	3 18 10
Globe Telegraph and Trust	10	6	6†	11 — 11⅜ xd	..	5 4 4
Do. 6 % Pref.	10	6	6	11⅜ — 12⅝	— ⅛	4 17 0
Great Northern Telegraph	10	20	5†	30 — 32	— ½	6 5 0
Indo-European Telegraph	25	13	..	57 — 59	..	5 10 2
Mackay Companies Common	$100	5	5	82 — 85	..	5 17 8
Do. 4 % Cum. Pref.	$100	4	4	67 — 70	..	5 14 4
Marconi's Wireless Telegraph	1	20	..	3⅛ — 3⅜	..	5 1 6
Do. 10 % Cum. Partic. Pref.	1	17	..	8⅛ — 8½	..	5 4 7
Monte Video Telephone, Ord.	1	6	6	1⅝ — 1⅞	..	5 13 0
Do. 5 % Pref.	1	5	5	⅞ — 1	..	5 14 3
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	98½ — 99½	—1½	4 10 6
Oriental Telep. and Elec.	1	10	..	1⅛ — 1⅛	—⅛	5 3 3
Do. 6 % Cum. Pref.	1	6	6	1⅛ — 1½	..	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	86 — 88	..	4 10 11
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	96½ — 98½	..	4 1 3
Reuter's	10	10	10†	9⅞ — 10⅛	..	9 17 6
Submarine Cables Trust	Cert.	6	6	124 —127	..	4 14 6
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	95 — 97	..	4 12 9
United River Plate Telephone	5	8	6†	6½ — 7	..	5 14 4
Do. 5 % Cum. Pref.	5	5	5	5 — 5½	..	4 11 0
West Coast of America	2½	2½	..	1⅜ — 1⅞	..	4 3 4
Do. 4 % Debs., 1 to 500 guar. by Braz. Sub. Tel.	100	4	4	94 — 97	..	4 2 6
West India and Panama Teleg.	10	1½	..	2½ — 2⅝	..	4 11 0
Do. 6 % Cum. 1st Pref.	10	⅝	6	9⅝ — 10½	..	5 18 5
Do. 6 % Cum. 2nd Pref.	10	6	6	9½ — 9⅝	..	6 3 1
Do. 5 % Debs.	100	5	5	99 —101	..	4 19 0
Western Telegraph, Ltd.	10	7†	7	12⅝ — 13½	..	5 5 8
Do. 4 % Deb.	Stock	4	4	94 — 96	..	4 3 4
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	94 — 97	..	4 12 9

*Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. 8s. in Funded Dividend Certs.

Continued on next Page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations Oct. 14th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Trams, Pref, Ord.	* 1	Nil	..	3/8 — 5/8	..	Nil
Do. 5 % Pref.	1	5	5	3/4 — 7/8	..	6 8 0
Do. 4½ % Deb.	100	4½	4½	70 — 75 xd	..	6 0 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	12½ — 14½	..	..
Do. Do. Deferred	100	..	..	4 — 6	..	..
Do. Do. 6 % Cum. Pr'f	100	6	6	86 — 89	..	6 14 10
Do. 7 % Non-Cum. Pr'f.	100	3	..	50 — 53	..	5 13 2
Do. 5 % Perp. Deb.	100	5	5	91 — 94	−1	5 6 5
Do. 4½ % 2nd Deb.	100	4½	4½	76 — 79	..	5 14 0
Central London Railway, Ord.	100	3	3	61 — 66	−10½	4 11 0
Do. Gtd. Assented	100	..	4	78 — 80	−1	5 0 0
Do. Pref.	100	4	4	70 — 75	−5½	5 6 8
Do. Gtd. Assented	100	..	4	81 — 83	..	4 16 3
Do. Def.	100	2	..	60 — 65	−13½	3 1 7
Do. Gtd. Assented	100	..	4	78 — 80	−1	5 0 0
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	98 —100	..	5 0 0
Do. Do. 1896	100	5	5	98 —100	..	5 0 0
Do. Do. 1901	100	5	5	97 — 99	..	5 1 0
Do. Do. 1908	100	5	5	97 — 99	..	5 1 9
Do. 4 % Deb.	100	4	..	93 — 95	..	4 4 3
Hastings Trams, 6 % Pref.	1	6	6†	½ — ⅝ xd	..	8 0 0
Do. 4½ % Deb.	100	4½	4½	66 — 71 xd	..	6 6 9
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2 1/16 — 2 3/16	..	4 17 7
Do. 4 % Deb.	100	4	4	73 — 78	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	77 — 81	..	6 3 5
London and Suburban, Ord.	1	..	..	1/4 — 3/8	..	..
Do. Do. 5 % Cum. Pref.	1	..	5†	3/32 — 5/32	..	..
Do. Do. 4½ % 1st. Deb.	100	4½	4½	73 — 78	..	5 15 5
London Elec. Railw'ys, 4 % Deb.	100	4	4	91 — 93	..	4 6 0
London United Trams, 4 % Deb.	100	4	4	60 — 64	..	6 5 0
Metropolitan Railway Consol.	100	1⅜	1½†	44 — 44½	−1½	3 13 0
Do. Surplus Lands	100	2¼	2¼†	59 — 61	..	4 10 2
Do. 3½ % Deb.	100	3½	3½	83 — 85	..	4 2 4
Do. 3½ % Pref.	100	3½	3½	78 — 80	..	4 7 6
Do. 3½ % Con. Pref.	100	3½	3½	76 — 78	−1	4 9 9
Metropolitan District Ord.	100	Nil	..	32⅜ — 33¼	−1	Nil
Do. 6 % Deb.	100	6	6	136 —139	..	4 6 4
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Do. 4 % Prior Lien	100	4	4	95 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	82 — 84	..	5 7 2
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	82 — 86	..	5 4 8
Do. 5 % Deb.	100	5	5	86 — 89 xd	..	5 12 0
Potteries, Ord.	1	3½	..	3/8 — 7/16	..	..
Do. 5 % Pref.	1	5	5	11/16 — 13/16	..	7 5 6
Do. 4½ % Deb.	100	4½	4½	82 — 86	..	5 6 5
South Metro. Trams, 6 % Pref.	1	6	6†	3/8 — 3/4	..	8 0 0
Do. 4 % Deb.	100	4	4	68 — 72	..	5 11 1
Underground Elec. Railways	10	..	..	3/32 — 4	..	Nil
Do. "A"	1/-	..	..	7/32 — 9/16	..	Nil
Do. 6% First Cum. Inc. Deb.	100	6	6	110 —112	..	5 8 1
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do. 6 % Income	100	6	6	83 — 90	−1	6 13 4
Yorkshire (West Riding), Ord.	5	Nil	..	1/4 — 3/8	..	Nil
Do. 6 % Pref.	5	8	1½†	3/8 — 3/4	..	..
Do. 4½ % Deb.	100	4½	4½	81 — 85	..	5 6 0

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4 1/16 — 4 1/8	..	5 11 4
Do. 2nd Pref.	5	5½	5½	4 3/8 — 4 1/2	..	5 18 11
Do. 4 % Deb.	100	4	4	91½ — 93½	+ ½	4 5 7
Do. 4½ % Deb.	100	4½	4½	96½ — 98½	..	4 11 5
Do. 5 % Deb.	100	5	5	98½ —100½	..	4 19 6
Auckland Trams, 5 % Deb.	100	5	5	100 —102	..	4 18 0
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11⅛	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	94 — 96	..	4 13 9
Do. 5 % 2nd Deb.	100	5	5	96 — 99	..	5 1 0
Brazilian Traction Light and Power	$100	6	6†	83 — 91	−2	6 11 1
Brisbane Trams Invt., Ord.	5	8	8†	7⅛ — 7⅜	..	5 5 0
Do. 5 % Pref.	5	5	5	4⅜ — 5⅛	..	4 8 11
Do. 4½ % Deb.	100	4½	4½	99 —102	..	4 8 3
B. Columbia Elec. Rly., Def.	100	8	8†	121 —124	..	6 9 1
Do. Pref. Ord.	100	6	6	109 —113	..	5 6 2
Do. 5 % Pref.	100	5	5	99 —102	..	4 18 0
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 —103	..	4 7 5
Do. 4½ % Vancouver Deb.	100	4½	4½	100 —104	..	4 6 7
Do. 4½ % Con. Deb.	100	4½	4½	89 — 92	..	4 12 5
Calcutta Trams, Ord.	5	7½	6†	6 — 6⅛	..	5 15 5
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Do. 4½ % Deb.	100	4½	4½	96 — 99	..	4 11 0
Cape Electric Trams	1	5	..	1/4 — 3/8	..	6 8 1
City Buenos Aires Trams (1904)	5	5†	5	5/8 — 5/8	— ⅛	4 13 0
Do. 4 % Deb.	100	4	4	92 — 97	..	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	90½ — 94½	..	5 5 10
Havana Elec. Rly., 5 % Bonds	$1000	5	5	94½ — 98⅝	..	5 1 6
Kalgoorlie Elec. Trams	1	Nil	..	3/16 — 5/16	..	Nil
Do. 5 % A Deb.	100	5	5	85 — 90	..	5 11 1
Do. 5 % B Deb.	100	3	..	1 — 28	−7	..
La Plata Elec. Trms, Ord.	1	..	..	3/8 — 1/2	..	..
Do. Pref.	1	4½d.	6	3/4 — 1 xd	..	6 0 0
Lisbon Elec. Trams, Ord.	1	6	6†	1 — 1½	..	4 16 1
Do. 6 % Pref.	1	6	6	1⅜ — 1⅝	..	5 1 0
Do. 5 % Deb.	100	5	5	91 — 96	..	5 4 2
Madras Elec. Tr. 6% Cum. Pref.	5	6	6	4½ — 4⅝	+ ⅛	5 17 1
„ Elec. Tr. (1904), Deb.	100	5	5	101 —103	..	4 17 1
Manaos Trams & Lt., 1st Deb.	100	5	5	..	..	5 12 4
Manila Elec. R. and Lg., Bonds	$1000	5	5	97 — 99	..	5 1 0
Mexico Trams Com.	$100	7	7	87½ — 89½	−2	7 16 5
Do. Gen. Con. 5 % Bonds	..	5	5	89¼ — 91½	— ½	5 8 8
Do. 6 % Bonds	100	6	6	92 — 94	— ⅛	6 7 8
Para Elec. Rlys. & Lt., Ord.	5	10	10†	5⅞ — 6⅛	..	7 18 10
Do. 6 % Pref.	5	6	6	4⅞ — 5⅛	..	5 17 1
Do. 5 % 1st Deb.	100	5	5	98½ —100½	..	4 19 6
Perth (W.A.) Elec. Tr., Ord.	1	5½	..	1⅛ — 1⅜	..	4 0 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	95 — 97	..	4 12 9
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	98½ —100½	−2	4 19 6
Do. 5 % Mort. Bonds	100	5	5	88⅛ — 90½	−4½	5 10 6
Sao Paulo Tram, Lt. and P. 5 % 1st Deb.	$500	5	5	100 — 103	−1½	4 16 2
Singapore Trams, 5 % Deb.	100	5	5	86 — 90 xd	..	5 11 1
Southern El. Tr. B.A., 5 % Deb.	100	5	5	93 — 95	..	5 5 3
Un. Elec. Trams Monte Video	5	7	7	4⅜ — 5	..	7 0 0
Do. 6 % Pref.	5	6	6	4 13/16 — 5 1/16	..	5 18 7
Do. 5 % 1st Deb.	100	5	5	97 —100	..	5 0 0
Winnipeg Elec. Rly., 4½ % Deb	100	4½	4½	98½ —100½	..	4 9 7

MANUFACTURING COMPANIES.

Aron, Ord.	1	7	..	9/16 — 11/16	..	8 12 4
Do. 6 % Pref.	1	6	6	13/16 — 15/16	..	7 18 4
Babcock & Wilcox	1	16	..	8 — 8¼	— 1/16	5 2 3
Do. Pref.	1	6	6	1 3/16 — 1 7/16	..	4 8 6
British Aluminium, Ord.	1	..	..	1 — 1⅛	+ 3/32	..
Do. 6 % Cum. Pref.	1	6	6	1 3/16 — 1 5/16	..	6 8 0
Do. 5 % Prior Lien Debs.	100	5	5	93 — 96	..	5 4 2
Do. Deb. Stk.	100	5	5	85 — 87	..	5 15 0
B I. & Helsby Cables	5	10	..	8½ — 8⅝ xd	..	5 14 3
Do. Pref.	5	6	6	6 — 6½	..	4 12 4
Do. Deb.	100	4½	4½	100 —103	..	4 7 5
British Thomson-Houston, Deb.	100	4½	4½	92⅜ — 95⅜	..	4 14 0
British Westinghouse, Pref.	8	Nil	..	1/16 — 1/8	..	Nil
Do. Deb.	100	4	4	66 — 69	..	5 15 11
Do. 6 % Prior Lien	100	6	6	100 —103 xd	..	5 16 6
Browett, Lindley, Ord.	1	..	..	2/- — 8/-	..	Nil
Do. Pref.	1	..	..	8/- — 8.6	..	Nil
Brush, 7 % Pref.	2	Nil	..	0 — ¼	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	70½ — 75½	..	6 12 5
Do. 4½ % Deb	100	4½	4½	85½ — 40½	..	11 2 2
Do. 4½ % Second Deb.	100	4½	4½	23 — 27	..	16 13 4
Callender's Cable	5	15	..	11 — 11⅜	..	6 7 8
Do. Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Do. Deb.	100	4½	4½	96 — 99	..	4 10 6
Cassner-Kellner	1	20	..	8 3/8 — 8 1/2	..	5 1 7
Do. Deb.	100	4½	4½	102 —105	..	4 5 9
Crompton & Co., Deb.	100	5	..	54½ — 59½	..	8 8 0
Dick, Kerr	1	Nil	..	5/8 — 3/4	..	..
Do. Pref.	1	6	6	1/2 — 5/8	..	6 17 2
Edison & Swan, A, £8 paid	5	Nil	..	0 — 1/8	..	Nil
Do. fully paid	5	Nil	..	1½ — 1¾	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Do. 5 % Second Deb.	100	5	5	63 — 68 xd	..	7 7 1
Electric Construction	1	5	..	9/16 — 11/16	..	7 5 6
Do. Pref.	1	7	7	1/2 — 1 1/8	..	6 11 9
Greenwood & Batley, Pref.	10	7	7	6½ — 7½	..	9 13 2
Do. Deb.	100	5	..	92 — 94	..	5 4 2
General Electric, 6% Pref.	10	6	6	9½ — 10½	..	5 14 8
Do. Deb.	100	4	4	87 — 92 xd	..	4 7 11
Henley's, Ord.	5	15	10†	12½ — 13	..	5 15 5
Do. Pref.	5	4½	4½	4 1/16 — 5 1/8	..	4 8 11
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
India-Rubber, G. & T.	10	7½	..	13½ — 14½	..	5 5 3
Do. Pref.	10	5	5	9⅝ — 10⅛	..	4 18 9
Telegraph Construction	12	20	5†	37 — 39	..	6 3 1
Do. Deb.	100	4	4	96 — 98	..	4 1 8
Williams & Robinson, 4% 1st Mort. Deb.	100	4	4	55 — 60	..	6 13 4

* Unless otherwise stated all shares are fully paid. † Interim dividend.

Bank rate of Discount 5 per cent., October 2nd, 1913.

SWEDISH EXPORTS OF ELECTRICAL GOODS.

The following statistics of the exports of electrical and similar goods from Sweden in 1911 are very interesting as revealing a continuance of the development of the Swedish manufacturing position; figures for 1910 are given for purposes of comparison, and notes of increases or decreases have been added; it will be noted that Sweden's capacity for exporting to markets in which we compete is rapidly extending, both as to the quantity exported and as to the range of markets:—

	1910. Kronor.	1911. Kronor.	Inc. or dec. Kronor.
Electric incandescent lamps.—			
To Finland	31,000	29,000	— 2,000
„ Russia	106,000	41,000	— 65,000
„ Denmark	33,000	44,000	+ 11,000
„ Germany	47,000	44,000	— 3,000
„ Great Britain	22,000	15,000	— 7,000
„ Argentina	26,000	—	— 26,000
„ Other countries ...	16,000	24,000	+ 8,000
Total ...	281,000	197,000	— 84,000
Dynamos and parts thereof.—			
To Norway	564,000	837,000	+ 273,000
„ Finland	149,000	171,000	+ 22,000
„ Russia	53,000	88,000	+ 35,000
„ Germany	39,000	98,000	+ 59,000
„ Great Britain	93,000	79,000	— 14,000
„ Spain	63,000	119,000	+ 56,000
„ Australia	113,000	47,000	— 66,000
„ Canada	127,000	294,000	+ 167,000
„ Other countries ...	32,000	123,000	+ 91,000
Total ...	1,233,000	1,856,000	+ 623,000
Electric motors and parts thereof.—			
To Norway	302,000	618,000	+ 316,000
„ Finland	27,000	58,000	+ 31,000
„ Denmark	61,000	30,000	— 31,000
„ Great Britain	119,000	174,000	+ 55,000
„ Spain	20,000	12,000	— 8,000
„ Brazil	29,000	—	— 29,000
„ Argentina	77,000	18,000	— 59,000
„ Other countries ...	37,000	133,000	+ 96,000
Total ...	672,000	1,043,000	+ 371,000
Transformers and parts thereof.—			
To Norway	75,000	260,000	+ 185,000
„ Russia	15,000	—	— 15,000
„ Denmark	33,000	—	— 33,000
„ Spain	—	96,000	+ 96,000
„ Australia	37,000	63,000	+ 26,000
„ Canada	200,000	124,000	— 76,000
„ Mexico	19,000	—	— 19,000
„ Other countries ...	13,000	12,000	— 1,000
Total ...	392,000	555,000	+ 163,000
Telephone instruments.—			
To Norway	77,000	46,000	— 31,000
„ Finland	279,000	514,000	+ 235,000
„ Russia	1,372,000	1,231,000	— 141,000
„ Denmark	224,000	132,000	— 92,000
„ Holland	160,000	349,000	+ 189,000
„ Great Britain	1,933,000	1,688,000	— 245,000
„ Mexico	116,000	155,000	+ 39,000
„ British S. Africa ...	—	199,000	+ 199,000
„ Other countries ...	54,000	721,000	+ 667,000
Total ...	4,215,000	5,035,000	+ 820,000
Petroleum and benzine motors.—			
To Norway	477,000	884,000	+ 407,000
„ Finland	244,000	249,000	+ 5,000
„ Russia	2,527,000	2,308,000	— 219,000
„ Denmark	206,000	133,000	— 73,000
„ Germany	461,000	652,000	+ 191,000
„ Holland	292,000	206,000	— 86,000
„ Great Britain	190,000	291,000	+ 101,000
„ Italy	150,000	103,000	— 47,000
„ Austria	346,000	291,000	— 55,000
„ Other countries ...	283,000	1,034,000	+ 751,000
Total ...	5,176,000	6,151,000	+ 975,000
Turbines.—			
To Finland	41,000	12,000	— 29,000
„ Great Britain	72,000	104,000	+ 32,000
„ Canada	236,000	111,000	— 125,000
„ Japan	—	118,000	+ 118,000
„ Other countries ...	31,000	179,000	+ 148,000
Total ...	380,000	524,000	+ 144,000
Cranes, &c.—			
To Finland	58,000	44,000	— 14,000
„ Russia	186,000	91,000	— 95,000
„ Other countries ...	66,000	63,000	— 3,000
Total ...	310,000	198,000	— 112,000
Copper wire covered with textile threads.—			
To Russia	207,000	350,000	+ 143,000
„ Denmark	131,000	63,000	— 68,000
„ Great Britain	96,000	190,000	+ 94,000
„ Other countries ...	22,000	40,000	+ 18,000
Total ...	456,000	643,000	+ 187,000
Steam engines.—			
To Russia	365,000	493,000	+ 128,000
„ Denmark	26,000	27,000	+ 1,000
„ Argentina	23,000	—	— 23,000
„ Other countries ...	39,000	101,000	+ 62,000
Total ...	453,000	621,000	+ 168,000
Steam turbines.—			
To Russia	171,000	184,000	+ 13,000
„ Finland	38,000	29,000	— 9,000
„ Holland	35,000	11,000	— 24,000
„ Other countries ...	19,000	30,000	+ 11,000
Total ...	263,000	254,000	— 9,000

Krona = 1s. 1¼d.

Arc and Spark Wireless Systems.—Users of continuous oscillations in radio-telegraphy claim that these waves are less absorbed in passing over the surface of the earth than are damped wave trains produced by spark sending. Attempts to verify this claim experimentally have shown no appreciable difference in absorption over moderate distances. In order to extend these experiments over greater distances, a 30-KW. arc operated by 500-volt D C. was installed in the high-power station at Arlington, Virginia, and the results obtained were communicated by Dr. L. W. Austin, in a recent issue of the *Journal* of the Washington Academy of Sciences. As these results have been much quoted in connection with the British Imperial system, it may be of interest to indicate their nature.

Comparisons were made, at a wave length of 4.100 m., between the current received at St. Augustine, Florida:—(*a*) When sending on the arc system with 47-53 amps. current in the aerial. (*b*) When sending from a 500-cycle spark 100-120 amps. in the antenna.

The distance between the two stations was 530 nautical miles. The received currents were measured by the calibrated detector galvanometer method, and it was found that they were directly proportional to the radiation currents at Arlington within 10 per cent., *i.e.*, at this distance there was no evidence of a difference in the absorption. This agrees with the results reported by Dr. Austin in March, 1912 (and mentioned by Mr. Marconi in his recent evidence), concerning the relative ground absorption for damped and undamped oscillations over a distance of 30 miles. From these experiments, Dr. Austin concluded that within the limits of the errors of observation, the ground absorption for that particular part of the country was the same in the case of both undamped and moderately damped oscillations.

The Arlington results were verified by the shunted telephone method using a slipping-contact detector at New Orleans, and also at Key West, both places being approximately 900 miles from Washington. The receiving apparatus was next placed on the *Arkansas*, and taken to Colon, 1,800 nautical miles from Arlington. There the receiving apparatus was taken to the naval radio-telegraphic station, and during two days' tests the arc signals were heard by day and night, whereas the spark signals were heard only after dark. These observations indicate that at 1,800 miles the continuous waves showed a smaller degree of absorption than the damped waves, but since the tests were made at a season (late in December) when exceptional days occur which might differently affect the two systems of operation, an additional series of observations was made during the recent voyage of the *Salem* to Gibraltar and back. In verification of the Colon experiments, it was found that for distances over 1,400 miles the arc (as judged by day-time reception) was equal to, or somewhat better, than the spark, notwithstanding the fact that the spark radiation current at Arlington was considerably more than twice as great as the corresponding arc current. Messages were continuously received by both arc and spark in the day-time up to 2,100 miles. Several times day signals were heard at greater distances, the arc being uniformly louder. Night signals were heard all the way to Gibraltar.

THE BRITISH ASSOCIATION.—V.

A New Method of Starting Mercury-Vapour Apparatus.

By John S. Anderson.

(*Section A. Abstract.*)

In the best types of mercury-vapour lamps and rectifiers at present on the market, the arc is started by tilting the lamp or rectifier, either by hand or automatically. This tilting arrangement is very often inconvenient. This is found to be especially the case when one is dealing with lamps used for scientific purposes. For example, in carrying out experiments on the Zeeman effect a mercury-vapour arc lamp is extremely suitable. But the difficulty arises from the fact that the lamp must be placed between the poles of an electromagnet, the distance between the poles being usually so small that any tilting apparatus that may be employed interferes with the proper mounting of the lamp.

Mr. G. B. Burnside and the author have overcome this difficulty by constructing a lamp which may be fixed in position between the poles of an electromagnet, or in any other suitable position, and then started without having to be tilted. This is brought about by the employment of a heating arrangement near one of the electrodes, preferably the negative electrode. The lamp tube is provided with a small vessel near this electrode, the vessel having a re-entrant portion or recess in which a heating element is placed. The part of the tube immediately above this small vessel and its recess is constricted. The heating element may conveniently consist of a small coil of platinum wire wound round a suitable support; it may be placed in the recess of the small vessel or removed at will, without interfering with the vacuum of the lamp. The heating coil of wire is connected in series or in shunt, in the latter case being provided with an automatic cut-out. An external resistance is placed in series with the lamp. Before starting, the small vessel is full of mercury, which forms a continuous connection inside the tube between the positive and negative electrodes. When the electrical current is switched on, the heating coil becomes incandescent, and the heat given off by the wire goes to raising the temperature of the vessel and its contained mercury, there being no appreciable loss by radiation into the surrounding air. Very little heat is required, because the first bubble of mercury vapour formed rises to the constricted portion of the lamp and is there caught, thus breaking the continuity of the mercury inside the lamp and starting the arc. Owing to the resistance of the mercury vapour, which is formed once the arc is started, the current is cut down to the value required for running the lamp. The platinum wire of the heating element can be made of such a thickness, and the external resistance can be so adjusted, that the wire does not emit heat when the lamp is working, but becomes incandescent when the lamp is started, the action being quite automatic.

Trade Unions and Co-partnership.

By John B. C. Kershaw.

(*Section F. Abstract.*)

The author in this paper discussed the statistics of the co-partnership movement in the light of the facts and figures given in the latest Government report on profit-sharing and labour co-partnership in the United Kingdom, and then dealt with the causes of past failures, more especially with the objections of the trade unions and their leaders to all extensions of the movement beyond its present limited field of application. The author's proposals for overcoming trade-union hostility were:—

1. Perfect freedom for all workers to join their respective unions if so inclined.

2. Recognition of trade-union rates of pay as a basis of the co-partnership scheme.

3. Election of selected labour leaders in each industry and locality as directors of large firms or companies.

The objections that might be raised to these proposals—by critics from both sides—were discussed in some detail, and the author expressed the opinion that the wave of unrest which is still troubling the industrial world in all countries will only be calmed and give place to more harmonious co-operation between capital and labour, when the manual workers are given a larger share of the profits of industry and a greater stake than they now possess in the welfare and prosperity of their country.

Co-partnership, in the author's opinion, is the most simple and effective means for bringing about this change in the organisation of our industries, and at the same time preserve that efficiency of financial and technical control, without which no industry can succeed in these modern days. Past failures in the attempts to run industries entirely by working men for the workers' own benefit have proved the need for a closer co-operation between *Capital, Brains and Labour*. There are three essentials required for the successful conduct of modern manufacturing industries: (1) A plentiful and cheap supply of capital; (2) a plentiful supply of skilled and contented labour; (3) skilled technical and business management which can take instant advantage of all opportunities offered for improving the manufacture, and of extending the market for the finished goods.

The co-partnership principle is the one which offers the best chance of attaining these three conditions of success, and if trade-union hostility to the principle could be disarmed, the movement would extend with amazing rapidity.

The Nomenclature and Definitions of Magnetic and Electrical Quantities.

Report of the Committee.

(*Section A. Abstract.*)

The report consists of a discussion on the present nomenclature and definitions of electrical and magnetic quantities, together with various alterations that have been proposed at times, and some new suggestions.

The names of several quantities in electrical and magnetic science are at present in a much confused state, several synonyms being employed, and these are in some cases inconsistent with one another. A definite and simple name for each conception is highly desirable.

The allotment of special names for units is a matter requiring very great care and examination of past experience in the popular acceptance of units. There is no doubt that a name helps people. At the same time, it is not in general desirable to create separate names for the units of quantities closely related to one another.

That a consistent and homogeneous system of symbols for the important units is a great convenience, will be generally agreed. The International Electrotechnical Commission has agreed upon a few symbols, and has made some important suggestions, that are under consideration and trial. These are quoted at length, and the bearing of these proposals on a general scheme is considered in detail in the report. The substance of the report does not lend itself to abstracting.

The Radio-Elements and the Periodic Law.

By Frederick Soddy, M.A., F.R.S.

(*Section B. Abstract.*)

During the present year, 1913, the general law governing the passage through the periodic table of the elements in process of radio-active change has been discovered. As the result it is possible to write the three disintegration series of uranium, thorium and actinium across the periodic table, so that each member falls into its proper place in the case of the 27 members the chemistry of which is known.

The chemical analysis of matter is thus not an ultimate one. It has appeared ultimate hitherto, on account of the impossibility of distinguishing between elements which are chemically identical and non-separable unless these are in process of change the one into the other. But in that part of the periodic table in which the evolution of the elements is still proceeding, each place is seen to be occupied not by one element, but on the average, for the places occupied at all, by no fewer than four, the atomic weights of which vary over as much as eight units. It is impossible to believe that the same may not be true for the rest of the table, and that each known element may be a group of non-separable elements occupying the same place, the atomic weight not being a real constant, but a mean value, of much less fundamental interest than has been hitherto supposed. Although these advances show that matter is even more complex than chemical analysis alone has been able to reveal, they indicate at the same time that the problem of atomic constitution may be more simple than has been supposed from the lack of simple numerical relations between the atomic weights.

Effect of Atmospheric Conditions on the Strength of Wireless Signals received at Liverpool.

By Prof. E. W. Marchant, D.Sc.

(*Section G. Abstract.*)

Measurements have been made over a considerable period of time, but those described herein deal mainly with observations during the month of July. The most accurate observations have been obtained with signals sent out by the observatory at the Eiffel Tower at 10.45 a.m. and 11.45 p.m. The method adopted in the earlier tests was to use a "Perikon" detector in series with a galvanometer and telephones, the measurement of strength being made by the cumulative deflection due to a series of known signals. This method was not found satisfactory with the Paris signals for which the antenna current used was known, and in the later tests an Einthoven string galvanometer has been employed by which the strength of signal for each individual spark at Paris could be observed to within ± 5 per cent. The results obtained show that there is a maximum variation from 0·6 to 1·3 in the strength of the signals received on different days in the same month; the average strength of signal being assumed to be 1·1, and that the current received on a fine, clear night is about 1·7 times as strong as that received in the day time.

Although no certain relationship can yet be regarded as established between the strength of a signal and the weather conditions at the sending and receiving stations, so far observation has shown that rain in Paris always corresponds with a diminution in strength of received signal. In one case, with a wind of 6 metres per second velocity, blowing in a N.W. direction, the signal-strength fell to half its normal value. The most favourable condition for signalling appears to be a cloudy sky at both sending and receiving stations, the signals being weaker when the sky is clear or covered with light clouds. Rain at the receiving station appears to have a comparatively small influence on the strength of the received signals.

The result of a set of special signals sent from the Eiffel Tower on the evening of Saturday, July 26th, 1913 (by the courteous arrangement of Comm. Ferrié), at intervals of 30 minutes, between 7 and 10 p.m. (which includes the time of sunset), shows that the increase in strength of night signals occurs just after sunset, there being an abrupt increase in strength of about 70 per cent. This change is quite sudden, there being comparatively little alteration n signal-strength until the sun has set and no perceptible increase n strength afterwards. There appears to be some evidence that signals are slightly stronger just after sunset than during normal night conditions.

Atmospheric Refraction and Absorption in Wireless Telegraphy.

By W. H. Eccles, D.Sc.

(*Section G. Abstract.*)

It seems to be agreed among the mathematicians who have worked at the subject that wireless telegraph signals could not be transmitted a quarter way round the globe by means of diffraction. According to some numerical results of J. W. Nicholson, a station rated at more than a million kilowatts would be required for communication with Buenos Ayres if diffraction alone were utilised. These calculations have all been made on the supposition that the earth is a perfect electrical conductor, and that the medium surrounding it is electrically homogeneous; but these conditions are by no means fulfilled, and it has been suggested that the transmission of signals to great distances is successful either because the earth is not a perfect conductor or because the air is not a perfect dielectric.

At night signals may travel to remarkable distances whatever their wave-length, and this suggests reflection rather than refraction; in the day signals of great wave-length travel best, which suggests refraction. The hypothesis introduced by the author, which attempts to account for this, is based on the assumption that the sun's rays ionise the atmosphere in such a way that the concentration of ions increases gradually as we ascend in the atmosphere. In this event, a ray started horizontally, say, will pursue a curved path with its concavity towards the earth; and thus, if the ionisation is great enough, an electric ray may follow and overtake the curvature of the earth.

The fundamental theorem is that the velocity of electric waves through a gas is increased by the presence of ions of molecular size in the gas. The velocity of long electromagnetic waves will thus exceed the velocity of light in an ionised medium. It may be remarked that if space is, as suggested by Schuster, in some degree conductive, long electric waves should travel faster than light waves from the sun to the earth.

Calculations indicate that if a suitable mathematical law of variation of refractive index could be assigned, the fall of intensity of signals with distance might be accounted for numerically without any absorption whatsoever. Something rather less extreme than this is, however, to be looked for, since formulæ that have been deduced for the absorption in highly ionised air prove that some absorption is to be expected in the case of rays traversing the higher levels of the atmosphere.

Short Heat Tests of Electrical Machines.

By W. R. Cooper, M.A., B.Sc.

(*Section G. Abstract.*)

Tests of dynamo-electric machinery are generally carried out extending over six hours in order to determine the maximum temperature rise. Suggestions have been made that such tests might be considerably shortened by assuming that the curve of temperature rise is a logarithmic curve. The author gives a brief account of the methods that have been proposed, and points out that the "thermal time constant," on which the behaviour of a body in heating and cooling largely depends, should be found most easily, and under less complex conditions, from the cooling curve. In order to test the applicability of the various methods, tests were made upon a 5-kw. motor-driven dynamo. The curves of temperature rise were found to be fairly logarithmic. The usual method of running a machine on test is to run on constant output with constant voltage, which necessitates increasing the input to the field coils as their resistance rises. A truly logarithmic curve can only be expected if the input of heat is at a constant rate, so that a better result would be expected if a machine were tested with constant input to the field coils, the output of the machine being constant but at varying voltage. Actually this method of testing was not found to give an improved result. Graphical methods appear to give better results than formulæ, as the latter are very sensitive to such errors in the data. In any case only certain portions of the temperature rise curve should be used, and any formulæ depending on the initial rate of temperature rise should be avoided, as this is difficult of exact determination. The curve of cooling has certain advantages; only a small portion of it seems suitable for graphically determining the thermal time constant, but this quantity can be derived much more readily by the time taken for a certain percentage drop of temperature rise. In the results given there is better agreement between the values found for the thermal time constant than for the maximum temperature rise. It is suggested that a fair approximation to the maximum temperature rise can often be obtained by testing for a time equal to, say, 1½ times the thermal time constant, deducing the value of this constant from the cooling curve, and thence the maximum temperature rise from the heating curve.

A New Method of Sealing Electrical Conductors through Glass.

By John S. Anderson.

(*Section A. Abstract.*)

While experimenting with a new method of starting mercury-vapour apparatus Mr. G B. Burnside and the author experienced great difficulty at first in obtaining a satisfactory method of sealing the electrical conductors through the glass of the lamps with which the experiments were carried out. Mr. Burnside, however, solved the difficulty by devising a simple method whereby platinum wires may be sealed through Jena glass; according to the same method other conductors, such as copper wires, may be sealed through ordinary glass.

The method consists essentially in fusing the metal and glass together in the usual way and then immersing the seal, after it has cooled to about a red heat, in a bath of oil or fat. Each immersion lasts about two or three seconds. The seal is immersed a little further in the cooling medium at each successive immersion until it is completely cooled.

For currents up to 15 amperes solid conductors may be employed, but for larger currents it is found advisable to make use of tubular conductors, which may be quite easily sealed through glass according to Mr. Burnside's method.

In preliminary experiments copper wires 1·5 mm. in diameter were successfully sealed through German glass, and platinum wires of 1 mm. diameter were sealed through Jena and other glasses. A copper tube, capable of carrying a current of 100 amperes, was sealed through German glass. Platinum wires were sealed through Jena glass in mercury vapour lamps, and the seals were found to be air-tight after a period of over eight months, although they had from time to time been subjected to the heat of the lamps when burning.

The chief advantages of this method of sealing electrical conductors through glass are as follows: (1) The process of obtaining seals is much simpler than any at present in use; (2) for incandescent electric lamps and all kinds of vacuum tubes, with the exception of mercury-vapour apparatus, copper or other high conductivity metal may be used as the conducting material; (3) in the case of mercury-vapour apparatus a minimum quantity of platinum is used in the tubular form of conductor for large electrical currents, because the tubular shell may be filled in with copper, subsequent to the sealing process; (4) conductors of very much greater cross-section than it has hitherto been possible to employ may be sealed through glass; (5) the one process is applicable to all kinds of glasses.

The Chemistry of the Radio-Elements.

By Alexander Fleck, B.Sc.

(*Section B. Abstract.*)

Since last year's meeting at Dundee, when the chemistry of three short-lived radio-elements was described, the study has been continued, and the chemical nature of 11 additional radio-elements has been worked out experimentally. In each of these cases, with the one exception of Uranium-X_2, the chemistry of the substance may be summed up by saying that it has properties identical in all respects with those of some already known element.

The results of the work show that:—

1. Uranium-X and radio-actinium are chemically identical with thorium.
2. Mesothorium-2 is chemically identical with actinium.
3. Radium-A is chemically identical with polonium.
4. Radium-C, thorium-C, actinium-C, and radium-E are chemically identical with bismuth.
5. Radium-B, thorium-B, and actinium-B are chemically identical with lead.
6. Thorium-D and actinium-D are chemically identical with thallium.

In the cases in which the inseparable elements are common elements these latter have all atomic weights above 200, and occupy one or other of the last 12 places of the periodic table.

A Magnetic Susceptibility Meter.

By W. H. F. Murdoch.

(*Section A. Abstract.*)

The author uses a unipolar method of testing, with the addition of a circular coil in series with the magnetising solenoid. This coil acts upon the magnetometer needle which is lying in a neutral field of force, so that the tangent of the resulting deflection due to the magnetic material plus coil is strictly proportional to magnetic susceptibility.

A mirror may be used to read the deflections, and in this case susceptibility = deflection × constant.

It follows that such an instrument with tangent scale and pointer can be graduated so as to read directly the value of the susceptibility coefficient in C.G.S units. To fix the value of H the current is measured and the values are multiplied by a constant.

The theory of the instrument was given, and an example of its use for testing iron, together with a diagram of connections and curve of results.

The various corrections were also briefly discussed.

ANTIPODEAN VIEWS.

A Resumé of the Impressions of an Englishman Visiting Australia and of an Australian Visiting Europe.

A fortunate consequence of twentieth century ease of travel is that engineers of the present day are able, in increasing numbers, to take advantage of the facilities which they and their predecessors have created, and, by visits to distant countries, to extend their knowledge by actual observation of conditions, practice and results therein. There can be no doubt that travel is of the utmost importance to the technical man, whatever his profession, not only in respect of the experience and knowledge which he himself gains, but also in respect of the assistance which he is thereby enabled to give to his employers—whether private or municipal—and to his colleagues. The advantages accruing to a firm which sends a competent member of its staff abroad or on a world-tour are obvious, and innumerable instances might be quoted in which municipal or State engineers have, during such travels, gained information which has been applied to the public benefit. The engineer who travels as the representative of a technical society, or who carries letters of introduction from a public body, naturally finds many avenues open to him which are closed to the representative of a private firm, but, whether travelling as a public or private person, he cannot fail to acquire a mass of invaluable data and to broaden his outlook upon the problems with which he is called upon to deal in his regular employment. The impressions gathered by such a traveller form the best substitute for actual travel, and as such, and because we cannot all be globe-trotters, they deserve wide publicity and careful study.

At the present moment we are in the unusual position of receiving simultaneously Mr. Justus Eck's account of his tour in Australia, and a collection of engineering notes compiled by Mr. E. H. W. Westwood (hon. sec. Victorian Institute of Electrical Engineers), during his recent visit to Europe.* Both gentlemen have many interesting things to say, and in the following paragraphs we reproduce the most striking of their opinions and criticisms. To quote Mr. Eck, with over 600 central public electric generating stations, all within the compass of an afternoon's journey, the home-staying engineer is apt to consider there is little or nothing to be learned in a visit to Australasia, with its 200 stations, many of the smallest conceivable size, widely isolated, and the whole of them supported by a total population which is less than that of London. Local conditions, however, vary enormously in different parts of the world—not only in actual physical respects, but also in the general conditions and manners of life and in administrative equipments and methods—and these conditions and their consequences it is desirable to study, particularly since it often happens that practice which has arisen naturally and of necessity in a certain district offers considerable advantages in other cases where it would never evolve naturally. Again, the combinations and permutations of natural and artificial conditions in various parts of the world often produce a demand for unusual types and ranges of apparatus, and full appreciation of the justification for this demand can only be had by actual acquaintance with the conditions producing it.

Generally speaking, the managing engineer in Australia and other "new" countries has a freer hand in the design and execution of his work than has his *confrère* in this country, and Mr. Westwood is of opinion that many English and Continental engineers would starve in private practice in Australia owing to the communities there being too small to permit of specialisation to any great extent. Now that the engineering department of the Melbourne University is in working order, the prospects for higher technical education are distinctly brighter so far as Victoria is concerned. Mr. Westwood regrets that "two essential parts in the training of almost all engineers at home"—the use of the slide rule and a knowledge of technical German—are much neglected in Australia. We fear that a knowledge of German is none too common a qualification among technical men in this country.

Although every State in the Commonwealth has its own idiosyncrasies, Mr. Eck finds existant among its electrical engineers a freemasonry which is all for the good of the industry and which helps greatly in the dissemination of knowledge and experience. He quotes numerous illustrations of the fact that Australia is able to supply most of her needs from her own talent, and he dwells at some length on the state of technical societies in the Commonwealth. For the Victorian Institution of Electrical Engineers, Mr. Eck has nothing but praise, and he expresses the somewhat heretical—but, we believe, quite justifiable—opinion that this Society will do well to preserve its independent existence, at least so far as concerns the British I.E.E. Standing alone, the Victorian Institution will be best able to adapt itself promptly to the requirements within the area of its influence. In some of the other States of the Commonwealth, affairs are less satisfactory; plenty of talent is available, but powerful electrical societies have yet to be organised. It is likely that some of the scattered honorary local secretaries now representing the British I.E.E. in various parts of the Commonwealth will ultimately become the promoters of strong local independent bodies.

In connection with office organisation and manufacturing methods in this country, Mr. Westwood comments favourably upon the systematic working adopted in the offices of large British firms, but states that automatic machinery is not used either on the Continent or in England to anything like the extent he had expected. Automatic features chiefly predominated in purely mechanical works (such as chain, pump and automobile manufactories). A well-known Glasgow firm, which appears to be much ahead of its competitors in this respect, had sent two members of its staff on a four months' tour through the States to study and purchase the latest forms of automatic machines.

Without much encouragement in the way of propaganda, the general public in Australia has shown a remarkable avidity to absorb all the electrical supply available, but it is surprising when one realises how much more important electric supply is in the Commonwealth and the Dominion than at home, to find such vast areas as North Sydney without current, and the suburbs of most of the big cities with no, or insufficient, electrical supply. According to Mr. Eck, the reason is that the growth of Australian cities has been unprecedented, and the land, due largely to the nationalisation of the railways, has wanted facilities in the way of quick and suitable tram service. Thus, the necessity of living on the fringe, if not actually in the city, has resulted, and districts planned as small adjacent townships have become suburban, or integral, sections of the city. The Government of New South Wales has proved the only authority capable of handling the parochial prejudices which even now stand in the way of realisation of the Greater Sydney scheme. Perhaps, on the same ground, the Government will take over the electric supply of the enormous areas north and south of Port Jackson.

There seems to have been in the past little confidence among many engineers in charge of Australian central stations in the future of electricity, and this, together with the rapid increase in demand which has actually occurred, has resulted in many stations operating with no adequate margin of plant capacity, and, of course, without means of borrowing supply from a neighbouring undertaking. Recently a serious effort has been made to adopt standard supply pressures and frequencies, Wellington (N.Z.) being now almost the only important town with an abnormal supply frequency (80 cycles). Isolated plants in mines, &c., seem to have absorbed all the freak plant.

Fans, heaters, cookers, domestic motors, &c., will be used in large quantities as soon as more current and livelier propaganda are universally available. Already current is frequently as cheap as in this country, and both as regards actual price, and in comparison with the local charges for gas, the consumer gets good value for his money.

* For the original text of these communications, reference should be made to the *Australian Mining Standard and Electrical Record*, page 429, *et seq.*, and the *Proceedings* of the Victorian I.E.E., page 9, *et seq.*, 1913.

The moderate price of current, the high wages of domestic servants, and the trying summer temperatures, have created a good demand for electric heaters and irons wherever sufficient current supply has been available. It is, perhaps, partly due to the land being so closely related in climate to the United States, and so conveniently situated with regard to North America, that American types of apparatus are in such evidence. European apparatus is, however, available, and one Melbourne firm is doing good business in the manufacture of electric heating apparatus.

Many good showrooms have been established, that in Melbourne being particularly fine (largely owing, be it noted, to information gained by Mr. H. R. Harper on his recent round-the-world tour). As in this country, the gas interests realise the importance of electricity as a competitor, and "though the electric showrooms are good, the gas ones seem better and *more publicly placed*" (the italics are our own). A well-organised and worked showroom is undoubtedly an expense, but it creates constant interest in electricity, and affords a means of combating directly any misrepresentations made by gas advocates.

Mr. Westwood states that, having seen the general state of wiring in Australia, India, Africa and Europe, he believes the Australian wiring to be as good as, or better than, that which he saw in England, and he considers Continental wiring to be the last word in bad work.

The overhead distribution system common in Australian towns offers inestimable advantages in supplying growing areas, particularly in suburban districts, where houses are small and plots large. The cheapness of the line construction and the ease of adding to or altering the feeders are wholly to the advantage of consumers, and Mr. Eck reports great improvements in verandah construction; it now only needs a good effort to standardise on a verandah which will carry and conceal feeder cables and provide suspension supports for overhead trolley wires and positions for arc lamps for street and window illumination. Large shops are at present often lighted after closing hours by arc lamps hung under the verandahs, and the design of the latter is often such as to bring the lamps unpleasantly low.

In discussing English switchgear, Mr. Westwood comments upon the great confusion prevailing in this country between "English" and "Continental" practice. He says that England is the dumping ground for American and German switchgear, and "English practice is to take either country's standard lines, and that greatly dependent on the idosyncrasy of the engineer-in-chief." Mr. Eck states that the cardinal failing of the Australian in purchasing a low-priced instead of a cheap article leads to much inferior workmanship, poor economy, and improper or insufficient switching arrangements, particularly in the lighting field.

Standard ratings for machines are not fixed, and probably (says Mr. Eck) never will be. The British Engineering Committee Standards are applicable to the southern parts of the Continent but are not suitable for Queensland and the northern parts. Rules, regulations and specifications for electrical plant, apparatus and installations, have been codified by the engineers of the Fire Underwriters' Boards in the various States, but the administration of them differs considerably, and apparatus permitted in one district is often prohibited in another with insufficient time notice to importers to enable them to utilise stocks already ordered, and in some cases in course of delivery. This is a real hardship to traders, and is a state of affairs which should be remedied forthwith.

For organisation, design and good construction, Mr. Westwood saw little to equal the Adelaide tramways, and Mr. Eck also comments upon the high development of electric traction on street railways in Australia. The geographical position of the sub-Continent has brought it under the influence of both British and American practice, hence work of the most diverse character is to be seen. With the exception of Melbourne and, to a less extent, Sydney and Brisbane, most cities have no suburban lines and stations, or have failed to develop these for the convenience of passengers, and this has naturally resulted in the development of good tramway services in all the large and many smaller towns. Generally speaking, the systems have been laid out to attract passengers, and have proved very successful in operation. Mr. Westwood speaks very favourably of the performance and prospects of railless trolley 'buses in this country, but in discussing his (Mr. Westwood's) paper, Mr. Noel Murray urged that from the public's point of view, a trackless could not be compared with a track system, since the laying of rails gave a guarantee to settlers on the route that the service would continue. This view, though worth recording, appears to be fallacious; one of the chief claims made for trackless trolley vehicles is that they make it possible to give travel facilities to a new district long before track-cars could be afforded, and yet involve no expenditure which does not go towards the trolley tram system ultimately to be established, and the development (by aid of the trackless vehicles then liberated) of further new districts.

In Melbourne, Mr. H. R. Harper is performing pioneer work in the field of storage battery traction for commercial and private vehicles.

The electrification of the Melbourne surburban railway lines is to be carried out under the guidance of Mr. Chas. Merz, and it is hoped that complete electrification of the tramways, and numerous improvements in the terminal manipulation of rolling stock and traffic, will soon be effected in this city. The stupendous underground railway scheme proposed in Sydney, involves far greater engineering difficulties than were encountered in the construction of the London tubes, but the project must eventually be carried out since an overhead railway is inconceivable, and the north and south traffic across the city must continue to increase by leaps and bounds. Branch and even main line electrification is likely to become an accomplished fact in New Zealand at an early date, and the vast water power available in the Dominion foreshadows almost unlimited developments in the utilisation of electrical energy for agricultural, industrial, and domestic purposes.

Naturally, Mr. Westwood was impressed by the impetus given to electrical supply in Europe by the perfection of metallic-filament lamps, and he comments favourably on the recent progress made in the construction of magazine and enclosed flame arcs, and on the great amount of research work still being carried out in this field, particularly in Germany.

The electric lighting of streets in Australia is steadily being taken over by electricity works, but though modern and efficient installations are provided in many towns, others are still characterised by very deficient lighting arrangements, even in the main thoroughfares. Too much dependence is often placed on the illumination derived from shops, with the result that after 10 p.m., and on Sundays, practical darkness prevails unless the moon shines. "The straight wide streets of Australian towns are well adapted to arc lighting, and the agreeable after-dark temperatures call for the above state of affairs to be remedied, so that citizens may find their streets agreeable and safe to use at night."

In shop lighting, the striving after concealed lights is obvious, but poor results are generally obtained. Only a medium degree of illumination is generally produced, and the many reflections of the "concealed" lights produce as much glare and distraction as though the lamps were bare and at eye level.

The splendid sunlight of Australia and the North Island of New Zealand demand good interior daytime illumination, which the use of verandahs renders difficult of achievement from daylight. Good electric lighting is, therefore, necessary, and to about twice the intensities adopted as standard in England, where the artificial illumination is in contrast with street lighting and not with brilliant daylight. With such intensities, the question of maintenance costs, as well as absence from glare, have to be carefully studied. The best shops are adopting indirect lighting, in most cases by arc lamps burning pure carbons and giving colour-true rendering of the fabrics and materials displayed. In small establishments where colour-truth is not of so great importance and where the restricted size of the room prohibits arc lamp lighting, indirect lighting by metal-filament lamps is being adopted, and there is no doubt that before long the American indirect and diffused lighting systems will appear and be adopted.

Australia is ahead of England in adopting automatic telephone exchanges, and the apparatus installed is good in

design, both as regards materials and strength. As in most countries, the subscriber's apparatus is very diverse in type and method of operation. The hand-combination instrument is still in use and, in common with many other telephone users, Mr. Eck laments the day when this convenient set gave place, in this country, to the heavy pedestal transmitter with no speaking key and a separate receiver. In the field of wireless telegraphy, Australia is showing progressive independence by manufacturing large quantities of wireless apparatus, notably in Sydney, under Father Shaw's patents.

In conclusion, Mr. Eck notes the generally superior education and intellectual equipment of members of the electrical fraternity, and predicts a permanently successful future for electrical engineers in Australasia.

THE ELECTRICAL PROTECTION OF SHIPS' HULLS.

It is recognised pretty extensively among marine engineers that corrosion of the exterior of ships' hulls is very largely an electrolytic question. The couple formed by the junction of two dissimilar metals and the presence of sea water is quite sufficient to set up an extensive pitting action, which, unless checked, may have very serious results. Recently an adaptation has been made of a process which has given excellent results in connection with the protection of steam boilers, condensers, &c., and which, in a good many installations both on land and at sea, of important size, is replacing the older method of attaching in the interior of the boiler plates of zinc which are electro-positive as related to iron or steel. This method is known as the Cumberland process, and has been developed by the Cumberland Syndicate.

The principle on which this depends is as follows :—The iron anodes, suitably insulated, are immersed in the water contained in or surrounding the metallic vessel which has to be protected, and a measured amount of electricity is supplied to each anode. The regulation of the current is effected by a separate resistance coil in series with each anode which, with the resistances, are insulated from the parts to be protected, and the plate is connected by wire to the positive pole of a source of electricity supply, while the metallic parts of the vessel to be protected are connected to the negative pole of the supply source. The current, therefore,

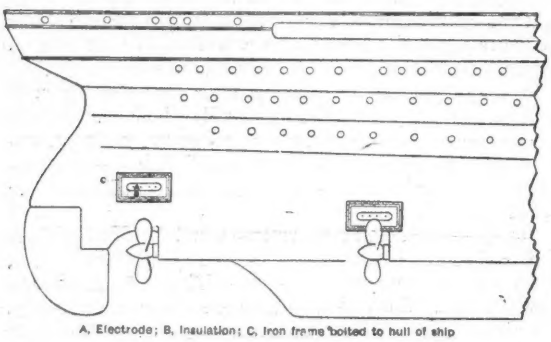
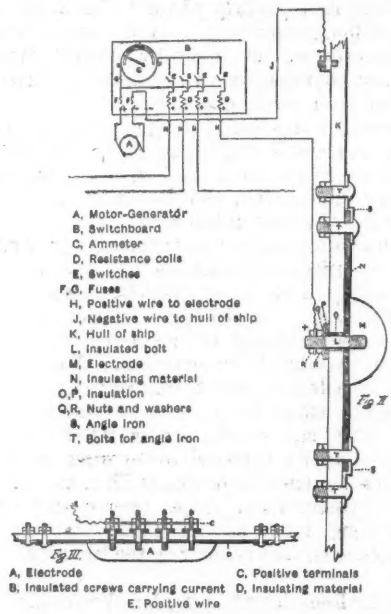


Fig. 1.

passes from the positive pole of the generator to the anodes, through the water which is decomposed by the current, and enters the metal comprising the vessel to be protected, returning thence to the negative pole of the generator. In this way the destructive agencies of the water are directed away from the metal of the vessel to the iron anode which is attacked, oxide of iron being formed, while the negative vessel suffers no change, the only perceptible result being in the case of a strong current, the formation of bubbles of hydrogen. The life of an anode depends on its weight, and also on the amount of current consumed, and as iron is a cheap metal, and one which can easily be replaced, the method is commercially sound.

Fig. 1 illustrates the method of adjustment of the electrodes. It will be seen that the plate A is surrounded by insulation B interposed between the electrode and the iron frame C, which is bolted to the hull of the ship. This will be seen more clearly from figs. 2 and 3, the latter showing the use of insulated screws carrying current, and the insulating material, while fig. 2 shows the complete electric circuit. A is the motor-generator, the motor being fed from the electric light and power mains of the ship, while the generator is capable of giving a pressure of from 6 to 10 volts, direct current. By suitably varying the resistance B in series with each anode, a distribution of current can be effected giving the best overall protection throughout the parts of the ship likely to be effected by the electrolytic action of sea water.



Figs. 2 and 3.

This is a comparatively new development, but the Cumberland process applied to steam boilers and condensers has met with such distinct success that some of the largest vessels are now equipped in this way. Among these may be mentioned the vessels of the White Star and Cunard Companies, such as the *Mauritania*, *Luisitania*, *Laurentic* and *Celtic*, while important electric power houses such as those of the New York and Brooklyn Edison Companies, the City and South London Railway, &c., have installed the process for the protection of their steam raising and utilising plant. It will probably not be long before some such process as the above, applied to the protection of ships' hulls, is regarded not as a novelty but as a necessity.

REMINISCENCES OF THE MISTY PAST.

By G. A. NUSSBAUM.

When, in the latter part of the seventies, the Jablochkoff candle and various arc lamps had given such a great impetus to electric lighting, the rush of all sorts and conditions of men to the new industry was simply amazing, at least, it was so in France. On a smaller scale, it must have been something like the Californian gold fever. Tremendous fortunes were to be realised by inventors, the gasworks were to be put on the scrap-heap, and there was a panic amongst the shareholders.

I had just come to Paris after some years of hydraulic engineering in the provinces, and joined a consulting engineer. Many of my friends were going over to the new industry, and I was urged to do the same. However, as I

had interesting work on hand, I did not feel inclined to change saddles until the new industry had settled down into a steady groove; heretic that I was, I even held on to some gas shares I had bought a few years previously. But fate lay in wait for me; one morning a friend, afflicted with a considerable fortune, called on me and explained that he had commenced financing a new electric lamp which was to put the Jablochkoff and other burners in the shade, and he wanted me to enter the new concern to look after his interests. His carriage being at the door, I was bundled into it, and we drove to the heights of Montmartre, where a small laboratory and workshop had been installed in the "Passage Cotin." He introduced me to the inventor and a staff of very intelligent looking young men. The "marvellous" invention was the little slide-lamp, which, in 1882, lighted one of the courts at the Crystal Palace Exhibition. I told my friend that I was not competent to judge the value of the invention, and urged him to take advice of a first-class electrician before sinking more money in the affair, but the electrical fever held him in its grip. I had to leave my post and enter the undertaking, and had to improve my knowledge as best I could. At that period there were no men who had more than an elementary smattering of electric lighting. The theory on the construction of dynamos, motors, and lamps, was very hazy, even among the high priests of the profession; it was guess-work with us and most other manufacturers of those days. But all the same, what a merry hopeful time it was: we were all to become millionaires, and were discounting our future riches heavily. I remember an enthusiastic young electrician who used to pawn all his belongings each time he thought he had made a marvellous discovery, in order to give a decent christening to his invention; and what christenings they were!—no wonder few babies survived the ordeal. I wonder whether anyone still remembers some of the free lances of those days, le père Loutin, whose machines can still be found in some of the early text-books, de Meritens, the staunch champion of Magnetos *versus* Dynamos, some of whose huge magnetos were, I believe, installed for a time in one of the English lighthouses, and many other types.

Besides the slide-lamp we made various other apparatus, "*le brûleur à quatre charbons*," for instance, an arc lamp in the shape of an inverted pyramid, each electrode being formed by two flat carbon rods with electromagnets near the points to keep down the arc. An almost identical burner was re-invented many years afterwards, and used as a soldering lamp.

Every Thursday we had great receptions at our laboratory, when we made a series of public experiments, and frequently we had a very aristocratic audience. I remember having seen quite a string of carriages from the Faubourg St. Germain at the entrance of the little "Passage Colin"; people took a lively interest in electrical experiments in those days. The late M. Hospitalier was a frequent visitor at our laboratory, and so were the Comte du Moncel, the electrician; Comte Dumas, the chemist; Léon Gambetta, Rochefort and other celebrities, who came from time to time. People who knew the fierce pamphleteer only by his vitriolic outbursts in the Press have no idea what a charming conversationalist he could be when he chose.

The "clou" of our show was the melting of metals and minerals by means of the four-carbon burner; some attempts at welding and making steel castings from scrap iron were also made. One day a dainty little Marquise, doubting the possibility of melting one of her precious stones, handed in a ring (I forget what kind); it was soon reduced to a lump, stone and gold, to the great delight of the pretty owner. Great amusement was always caused by forming chains and giving electric shocks to our guests.

Sometimes we had visitors of a very different social standing—for instance, one Thursday evening there swaggered in a small band of "rôdeurs-de-barrières" (or Apachés, as they are now called), at their head a notorious scoundrel, known by the name of "La Terreur de Montmartre." The word was immediately passed that the beauties were to be got in a chain, which we did. Well, I have never witnessed such a rapid transformation as that of those ruffians. When released, they sneaked out a flabby, ghastly looking gang, with not an atom of bounce left in them; perhaps the shocks we had administered to them were not exactly of a mild kind. But there is a sequel to this incident. Years afterwards I was looking over some works, when, to my amazement, I saw my friend, "La Terreur de Montmartre," amongst the workmen. He evidently recognised me at once, smiled and doffed his cap. The manager told me that he was one of the steadiest and best mannered men on the premises, and my friend, the "terreur," dated his conversion from the day of his electrification at our laboratory. Now, here is a hint for the Home Secretary!

In 1883 the concern was made into a limited company, with works at Courbevoie, near Paris. There, several types of dynamos, motors and arc lamps were turned out, also an incandescent lamp for low voltages, the lighting body of which was composed of thin, straight carbon rods forming a triangle, cemented at the apex with carbon paste. As far as I know, all these creations, together with the company, are dead and buried long since. It was at the Courbevoie works that Mr. Charles Brown, of the well-known Swiss firm, Brown, Boveri & Co., took his first lessons in armature winding.

At the first Paris Electrical Exhibition in 1881, we made a pretty brave show, and received a gold medal for our arc lamps. But I must confess that the award was principally due to a long pole, kept in a corner, which was vigorously handled whenever the lamp-carbons came together or kept too far apart. Scouts were posted in various corners of the Exhibition to signal the approach of committee-members; then there was a wild rush for the poles, and the lamps were well shaken so that they might burn brightly for half an hour. Yes, arc lamps of those days required a considerable amount of coaxing, and all the manufacturers were more or less in the same boat.

One of the most amusing features of the Exhibition was the stand of the famous "bougie J.," invention of the late Prof. J., which was supposed to have solved the problem of division of light. In big letters, it was announced that 40 of these burners could be lighted by a single H.P. A number of these unfortunate candles were fitted on a large panel; before this edifying tableau the boss of the show was executing a continual "pas seul" in the frantic endeavour to keep his blinking lamps burning, correcting them with a stick like so many naughty children.

After the closing hour, we proceeded to a small restaurant behind the Exhibition, where we compared notes, and the fun waxed fast and furious until the small hours of the morning. Gas engineers were sometimes lured to this den and metaphorically tarred and feathered. Kind-hearted Wilfrid de Fonvielle, editor of the *Electricité*, frequently presided over these meetings.

Ah, me, where is that "barty" now? Vanished into the "Ewigkeit" most of them, where no doubt they are occupied with greasing lightning and superintending thunderstorms generally.

The "free lance" with his Fata Morgana always moving in front of him, has long departed, to make room for the steady plodding man, chock-full of science, as Captain Cuttle has it.

The electrical industry is developing on magnificent lines with ever-widening horizons, but the glamour of its "Vie de Bohème" has departed for ever; peace to its ashes!

Standardisation of Electric Lamps for Motor-Cars.—The Accessories Committee of the Society of Motor Manufacturers and Traders is following the example of the American Society of Automobile Engineers in endeavouring to bring about some degree of standardisation in electric lamps for use in connection with the electric lighting of motor-cars. A Sub-Committee was appointed to go thoroughly into the matter, and a joint meeting has been held with representatives of the lamp manufacturers. The various points dealt with in the discussion were (1) voltage, with regard to which the view was expressed that there should not be more than two standards. (2) Candle-powers.—The general opinion was that three standards were sufficient for head lights, and three others for side and tail lights. With regard to bulbs [illegible] was considered that the 33 mm. and 55 mm. sizes were the n[illegible]table. (3) Filament.—The kind known as "Helical Spark" appe[illegible]d to be preferable, whilst the position of the filament was devised according to the size of bulb. (4) Caps.—The small bayonet cap was agreed to be preferable for side and rear lamps, but with regard to head lights the maximum candle-power to which it was practicable, might, it was considered, somewhat depend on the holder.

ELECTRIC CONTROLLERS FOR HAULAGE SERVICE IN COAL MINES.

THE control gear illustrated and described below has been specially designed to comply with the revised Home Office Regulations which came into force in June, 1912, governing the use of electricity in mines.

Rule 15 of the regulations applies to those parts of the mine where inflammable gas, although not normally present, may, nevertheless, occur in quantities sufficient to be dangerous.

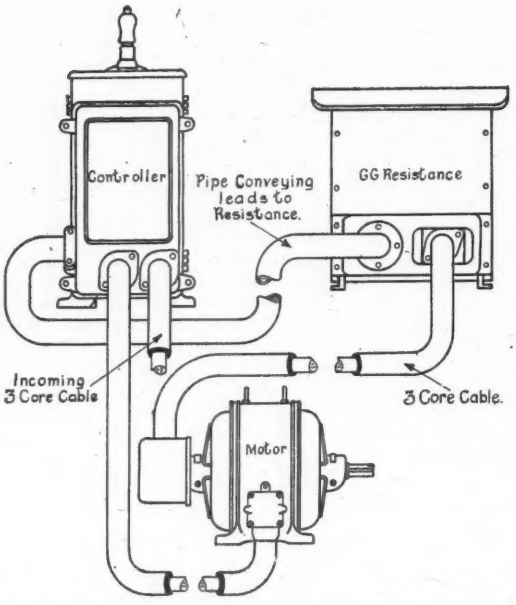


FIG. 1.—ARRANGEMENT OF PIPEWORK, &C.

In mines where the voltage exceeds low pressure (250 volts) it is now compulsory to arrange the wiring of the control apparatus and motors so that a continuous metallic casing is obtained for all cables throughout the mine; it is therefore necessary when installing control apparatus where Rule 15 applies so to devise this apparatus as to prevent open sparking.

It would be unnecessarily expensive to use controllers designed to comply with Rule 15 in those parts of the mine where this rule does not apply; for this reason the British Thomson-Houston Co., Ltd., have standardised two types of mining controllers in

FIG. 2.—EXTERIOR OF CONTROLLER.

capacities up to 250 H.P. and line voltages up to 3,000 for A.C. motors, and in capacities up to 100 H.P. and line voltages up to 600 for D.C. motors.

Direct current is still used in some of the older mines, but the motors used do not exceed 100 H.P. in size.

The arrangement for obtaining continuous metallic covering for the cables connected between motors, controllers and resistances is shown in fig. 1, for A.C. slip-ring motors; a simpler arrangement suffices for D.C. motors, the pipe connecting the rotor slip-rings to the rheostat being omitted. The frames of the controllers and resistances are provided with clamps for the pipes enclosing the single-core cables, and for the armouring of the three-core cables. The inlet for the pipe enclosing cables connected to the resistance is at the side of the frame, and the inlets for the cables for connecting to main switch and motor are at the back of the frame.

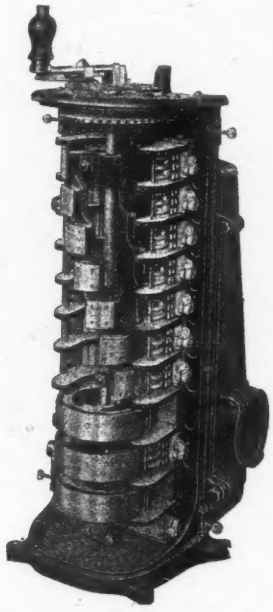


FIG. 3.—INTERIOR MECHANISM OF CONTROLLER.

Controllers for use where Rule 15 does not apply are of the vertical type, as shown in figs. 2 and 3; they have strong cast-iron frames and wrought-iron covers, and are operated by means of crank handles.

The frames of controllers for use with three-phase slip-ring motors are supplied in two forms: One suitable for all cables to be run in pipes, three pipes being required; the other for the rotor resistance cables only to be run in a pipe, the line and stator connections being made by means of three-core armoured cable, and two sets of clamps being provided on the frame for clamping the armouring to the frame.

For D.C. motors, the standard controller frames are arranged for connecting to three pipes: One for the incoming line cables; one for cables connecting the controller fingers to the resistance; and one for the cables connecting the controller fingers to the motor armature and field terminals.

Controllers for use where Rule 15 applies are built with strong cast-iron cases, having wide machined flanges between the box and the cover, and as an additional precaution against open sparking, all contacts on which arcing may take place are oil-immersed. These oil-immersed controllers are of the horizontal type, this form being the most convenient for inspecting the working parts.

FIG. 4.—HORIZONTAL TYPE OF CONTROLLER WITH OIL-IMMERSED CONTACTS.

Controllers up to and including 100 H.P. have the moving and fixed contacts supported from the under side of the cover, so that they are at once accessible for inspection and renewals when the cover is lifted. Figs. 4 and 5 show controllers of this type.

For capacities above 100 H.P. the controllers are designed so that the cylinder in each case is supported from a fixed frame, the oil tank being lowered from the frame when it is required to inspect the contacts. A tank-lowering device is provided with each controller, so that the tank when full of oil can be lowered with ease. The frame consists of a box-shaped casting mounted on four pipe supports. The frame also forms a terminal box for enclosing the terminals, which are mounted on studs passing through porcelain insulators fixed in the frame. The cylinder and finger bases are mounted below and supported from this frame, each finger base being connected to the under side of one of the terminal studs. Wide machined faces on the lower surface of the frame and the upper surface of the oil tank ensure that danger due to open sparking cannot result, should the correct oil level not be maintained. Fig. 6 shows a controller of this type suitable for a 250-H.P. 3,000-volt slip-ring motor.

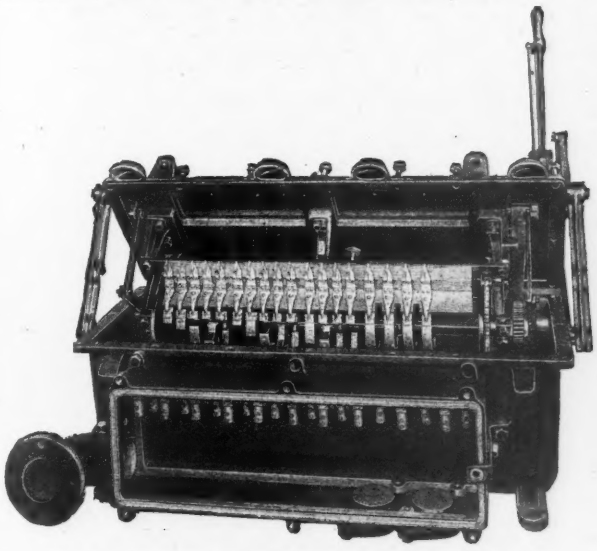


FIG. 5.—HORIZONTAL CONTROLLER, SHOWING ACCESS TO CONNECTIONS.

In all of the controllers described above, the working parts can be inspected without disconnecting any cables. Many types of oil-immersed controllers in use in mines in the past were of the vertical type, the contacts of which could only be seen by disconnecting the cables and lifting the controller bodily from the tank, a process involving considerable time and difficulty.

Oil-immersed controllers for large currents have in general been found to wear more at the arcing tips than air-break controllers working under the same service conditions. The latest types of 150-H.P. and 250-H.P. controllers built by the British Thomson-Houston Co., Ltd., overcome this trouble, and save the expense of frequent renewals to finger and segment arcing tips.

The resistances for use with the controllers described are constructed from the British Thomson-Houston standard air-cooled type C G units, consisting of iron grids insulated from their supports by mica, and grouped together to form resistance-boxes. The resistance-boxes are in turn assembled in three forms of frames, depending on the service and number of units required.

Fig. 7 shows a typical resistance for use with a British Thomson-Houston mining controller.

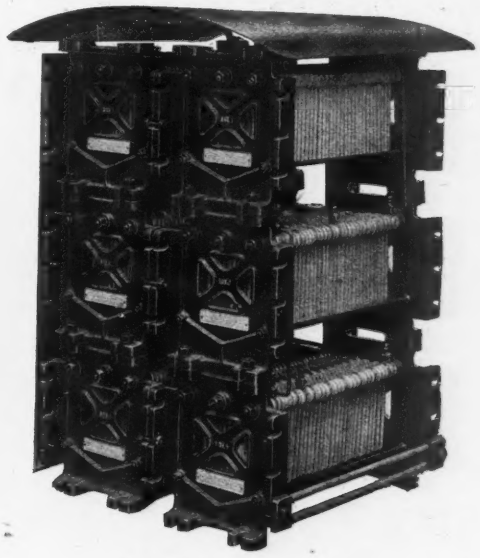


FIG. 7.—GRID RESISTANCE.

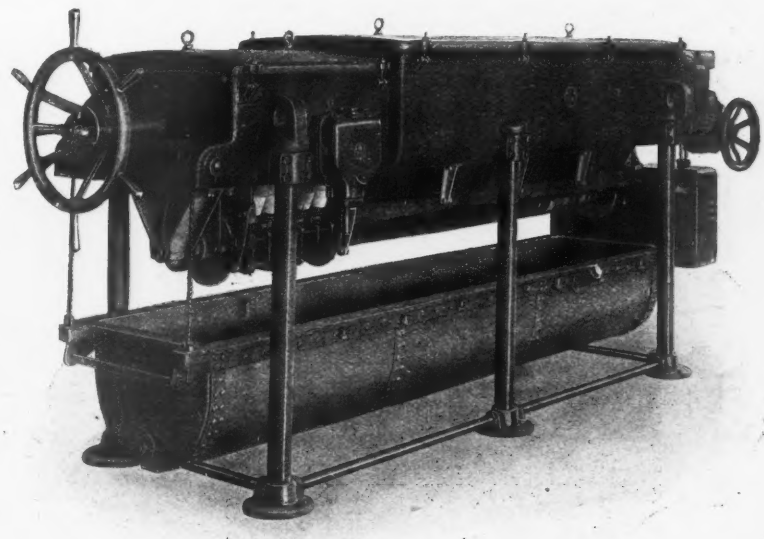


FIG. 6.—LARGE CONTROLLER WITH OIL-IMMERSED CONTACTS.

Paper Cables.—MESSRS. THE MACINTOSH CABLE CO., LTD., who are financially controlled by the well-known firm of Chas. Macintosh & Co., Ltd., of Manchester, have recently commenced the manufacture of paper cables at their new works in Liverpool, erected specially for this purpose. The company are in a position to quote for, and supply, all classes of paper-insulated cables. Messrs. Gillespie & Beales, of Amberley House, Norfolk Street, Strand, W.C., have been appointed the company's sole selling representatives for the south of England.

Lead.—In their report dated October 11th, MESSRS. JAMES FORSTER & CO. state:—"Closing prices last week were £20 7s. 6d. September, £20 October, £19 December and £18 12s. 6d. January. Early this week the 'bears' had a 'merry' time, selling freely for October and forward positions. October was done down to £19 12s. 6d, December £18 12s. 6d. and January £18 5s. These operations were apparently based on reports of improvement in the Mexican position, which, by the way, is scarcely borne out by the latest news, and the belief that supplies from that country would be shortly forthcoming. However, actual facts soon put a different face on the market. On Wednesday September lead was offered at £20 2s. 6d., and on Thursday £20 15s. was paid for this delivery, 'bears' coming into the open only to find that holders had little lead available. In justice to home dealers, it may be said that the 'bears' are chiefly Continental. The actual position is that at no time this year has lead been so urgently required. Important electrical consumers are begging for the metal, and contracts for export are behind-hand, owing to supplies being so inadequate. The export demand continues unabated, and on the top of all is a 'bear' squeeze. Yesterday, September lead was still wanted with £20 15s. paid. There were buyers at £20 5s. for October delivery; £19 2s. 6d. was paid for November and £18 15s. for December. We should, perhaps, explain that September lead is deliverable up to October 15th. Closing prices are:—£20 12s. 6d. prompt, £20 5s. buyers October delivery, £20 sellers October shipment, £19 5s. November, £18 17s. 6d. December and £18 7s. 6d. January. Consumers should ignore fluctuations in the market, and provide for their requirements in due time. That lead can become plentiful under existing circumstances is scarcely to be expected. The total production of the world has only increased 3 to 5 % in the last 10 years, while the consumption for electrical purposes has increased enormously during the same period. This is quite sufficient to account for the prevailing scarcity and absence of stocks. English lead, £21."

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

21,864. "Illuminated signs." V. von Vangel. September 29th.

21,891. "Marine cableways." T. S. Miller. September 29th. (Complete.)

21,901. "Electric water heaters or geysers." L. M. Waterhouse and Simplex Conduits, Ltd. September 29th. (Complete.)

21,918. "Telegraphic apparatus." A. A. C. Swinton. September 29th.

21,921. "Telephone exchange systems." D. H. Kennedy and J. W. Turner. September 29th.

21,924. "Electric tail-lamp with emergency globe for use on motor-cars and other vehicles." H. Atkinson. September 29th.

21,931. "Selecting device for electric bells and the like." W. E. Muntz. September 29th.

21,959. "Coil bobbin for primary-current coils of meters, measuring instruments or the like." Allgemeine Elektricitats-Ges. (Convention date, November 28th, 1912, Germany.) September 29th. (Complete.)

21,965. "Indicators, annunciators and the like." Sterling Telephone and Electric Co., Ltd. (Telephon-Fabrik Akt. Ges. vorm. J. Berliner Austria.) September 29th. (Complete.)

21,997. "Electrically-heated hot-air syringes used in the practice of dental surgery." G. F. Gadd and Western Dental Manufacturing Co, Ltd. September 30th.

22,023. "Method of and means for mounting electrical resistances or filaments on to supports for electric apparatus such as heaters and lamps." C. O. Bastian. September 30th.

22,024. "Electric glow-lamps or/and the method of manufacturing and operating the same." C. O. Bastian. September 30th.

22,035. "Construction of electric lampholders." A. A. Price. September 30th.

22,091. "Electric vehicle transmission." W. F. Cooper. October 1st.

22,093. "Metallic-filament lamps." H. Bleske and E. Schulze. (Convention date, October 3rd, 1912, Germany.) October 1st. (Complete.)

22,146. "Apparatus for high-speed telegraphy." J. Gell. October 1st.

22,149. "Dynamo-electric machines provided with commutators." H. Mensforth. October 1st.

22,157. "Telephone transmitting apparatus." A. H. Foote. October 1st. (Complete.)

22,176. "Brush or like sliding contacts for high-frequency electrical apparatus." A. S. Sörensen. October 2nd. (Complete.)

22,198. "Connecting-up of electric cables or conductors and the protection of their exposed ends and terminals." St. Helens Cable and Rubber Co., Ltd., and J. C. White. October 2nd.

22,220. "Electro-magnetic relays for use in connection with wireless telegraphy installations and for other purposes." A. B. Williams and W. A. Solomon. October 2nd.

22,222. "Manufacture of carbon electrodes for electric arc lamps." F. Lewis. (Convention date, July 2nd, 1913, Germany.) October 2nd. (Complete.)

22,223. "Manufacture of carbon-electrodes for electric arc lamps." C. Conradty (firm of). (Convention date, July 2nd, 1913, Germany.) October 2nd. (Complete.)

22,224. "Electro-pneumatic air-brake systems." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 2nd.

22,228. "Generator of electricity for automobiles forming a combined source of ignition and illumination." A. Sanchez and C. Baradat. October 2nd. (Complete.)

22,235. "Construction of electric fans of the oscillating or revolving type." S. G. Leach. October 2nd.

22,260. "Electric vulcaniser for tires." R. K. Hearn. October 3rd.

22,273. "Electrically-operated switches." B. Thomas and E. Thomas. October 3rd.

22,274. "Electrically-operated switches." B. Thomas and E. Thomas. October 3rd.

22,275. "Electrical rheostats." B. Thomas and E. Thomas. October 3rd.

22,319. "Arc-light carbons." H. Ayrton. October 3rd.

22,331. "Electric glow lamps or/and the methods of, manufacturing and operating the same." C. O. Bastian. October 3rd.

22,348. "Method of and apparatus for the control of electrical plant." H. J. Read and W. J. Branson. October 3rd.

22,358. "Manufacture of a material suitable for electrical insulation and other purposes." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) (Divided application on 8,417, 1913, April 9th.) October 3rd.

22,359. "Electrical baking-apparatus." W. P. Perry. October 4th.

22,390. "Systems and methods of control for electric motors." N. W. Storer. (Convention date, October 5th, 1912, United States.) October 4th. (Complete.)

22,394. "Alternating-current transformers." D. K. Morris and Morris and Lister, Ltd. October 4th.

22,405. "Lamp annunciators for telephone switchboards." Western Electric Co., Ltd., G. H. Nash and B. B. Grace. October 4th. (Complete.)

22,406. "Telephone hand sets." Western Electric Co., Ltd., G. H. Nash and B. B. Grace. October 4th.

22,420. "Electric distribution systems." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 4th.

22,421. "Resinous condensation products." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) (Addition to 24,254, 1912.) October 4th.

22,425. "Holders for incandescent electric lamps." H. Russell. October 4th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

Field-Magnets of Electric Turbo-generators. A. Rolfe. 14,056. June 17th.

Circuit Arrangements for Automatic Telephone Systems. Siemens and Halske Akt.-Ges. 18,418. August 12th. (August 14th, 1911.)

Electrical Accumulators. C. de Sedneff. 18,571. August 13th.

Flexible Metallic Clip for Attaching and Detaching Shades, Shade-holders, Advertisements, Decorations, Protectors and the Like to or from Electric, Gas, Oil or Vapour Lamps, or other Devices that may be Used for the Purpose of Illumination. F. Parks. 20,805. September 12th.

Apparatus for the Electrical Treatment of Gases and Vapours. W. T. Hoofnagle. 20,950. September 18th.

Systems of Electric Motor Control. British Thomson-Houston Co. (General Electric Co.) 21,263. September 18th.

Telephonic Receivers. A. Marr. 21,664. September 24th.

Branch Boxes for Electric Conductors. J. Kramer. 23,750. October 17th.

Electromagnetic Suspension Devices. B. Graemiger. 24,541. October 26th. (July 3rd, 1912. Addition to No. 24,499 of 1912.)

Switches for Use in Connection with the Electric Lighting Systems of Automobiles. B. Brooks and W. Holt. 25,420. November 6th.

Automatic Electric Circuit-breaking Arrangements. E. C. Möller. 27,580. November 29th. (Divided application on No. 6,920 of 1912, September 21st.)

1913.

Ozonizers. J. C. A. Henderson. 1,155. January 15th.

Connections for Continuous Electric Current Generators. Fried. Krupp. Akt.-Ges. 1,407. January 17th. (March 1st, 1912.)

Construction of Incandescence Electric Lamps. O. Schaller. 1,804. January 22nd. (August 23rd, 1912.)

Process of, and Apparatus for, Producing Ozone. J. Steynis. 3,769. February 13th. (February 13th, 1912.)

Automatic Electric Switches. H. C. E. Boutard. 5,546. March 5th. (March 6th, 1912.)

Apparatus for Photographically Recording Electrical Measurements and for like Purposes. Siemens & Halske Akt. Ges. 8,240. April 8th. (April 10th, 1912.)

Registering Circuits for Automatic Telephone Exchanges. Siemens and Halske Akt. Ges. 9,168. April 18th. (April 18th, 1912.)

Audible Signals for use in Determining Temperature. A. McNab. 9,695. April 24th. (April 25th, 1912.)

Fly-Wheel Storage Arrangements such as used in the Electrical Driving of Hauling or Winding Machinery. Siemens-Schuckertwerke Ges. 11,007. May 9th. (May 10th, 1912.)

Individual Telephone Mouthpieces. C. S. Warren. 11,198. May 13th.

Electrolysis of Aqueous Solution. Ges. für Chemische Industrie in Basel. 11,872. May 21st. (December 9th, 1912.)

Automatic Ships' Telegraph Alarms. J. A. Sullivan. 11,972. May 22nd.

Inductance Coils for Telephone or other Circuits. Siemens & Halske Akt.-Ges. 12,165. May 29th. (May 29th, 1912.)

Dynamo-electric Machines. Siemens-Schuckertwerke Ges. 14,390. June 21st. (June 22nd, 1912.)

Electric Switches. Siemens-Schuckertwerke Ges. 16,454. July 17th. (June 7th, 1913.)

The Position in Canada.—A correspondent writing from Ottawa, Canada, under date September 16th, comments as follows upon the present position of affairs:—"There is scarcely anything doing in the way of electrical progress in our western cities. They have run the length of their rope, and are now at a full stop. Some of the cities now have difficulty in finding money to maintain existing works. Calgary, Saskatoon, Edmonton, Moose Jaw, Regina, Prince Albert, and several other towns, are doing nothing in the way of civic improvements. Times are bad, and all the summer hundreds of men have been walking the streets in those towns unable to obtain work. Saskatoon, a town but eight years old, spent, in 1912, something like two million dollars in civic improvements. Now she has no money to spend on improvements, and finds it difficult to finds money for maintenance. These towns started to run before learning to walk; now they can neither run nor walk. These Western towns tried, and succeeded in a large measure, to become full-fledged cities all at once—to have the improvements of cities a century old, in four or five years. The towns mentioned all now have their asphalt street pavements, their wires in conduits underground, their Whiteway lights, their incinerator, street cars, modern railway termini, up-to-date power plants; all the waterfalls in proximity to these Western cities have been harnessed and utilised for both power and light.

"Some of these improvements are, as might be expected, in an incomplete state, and the difficulty in procuring money this summer leaves the vast work unfinished.

"Winnipeg is doing little improvement work just now. This city worked in the millions. Three million-dollar contracts have been quite common in the past five years. There are no million-dollar contracts given out by the city this year.

"Still these towns are perfectly solvent, and their large expenditure in the past five years may be justified on the plea of the indispensability of modern improvements, particularly for new and fast growing towns, for encouragement of growth. The money stringency this season is a blessing in disguise for these Western towns. It effectually stops their mad career of improvements. They will now have time to consider and look out upon their mushroom-built landscape with a good crop this year of 200,000,000 bushels of wheat and a big crop of oats and barley. Our Western cities will soon be handling lots of money. The good harvest of this year is a grand thing for the West even sentimentally, because it will have the effect of causing European money-lenders to retain confidence in Western securities. Western municipal securities are all right, and with another good crop next year, the West will again come into its own. Another good crop in 1914 is, however, necessary in order that the West may regain the confidence of the world of finance."

The Shops Act.—The Southport Corporation has made a closing order which embraces those carrying on business as electricians, and under which shops must be closed at 8.30 on Mondays, 1 on Tuesdays, 8.30 on Wednesdays and Thursdays, 10 on Fridays, and 11 on Saturdays.